The making of French space policy 1979-1992

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THE MAKING OF FRENCH SPACE POLICY 1979 -1992

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Summary

The French space effort is the third most important in the world after those of the USA and the former Soviet Union in terms of spending and programmes. France is closely involved in the European space effort coordinated by the European Space Agency, but scientific and industrial activities are not spread evenly amongst participating European nations and French space policy and the French space industry are the European leaders. This thesis examines the domestic national mechanisms of the making of French space policy in order to show how policy making originates in different components of the French high-tech complex and from various motivations.

The overall French space effort is composed of closely interrelated military and civil activities, the nature of which evolved rapidly during the 1980s and early 1990s as a result of the renewal of interest in military space triggered by SDI and the Gulf War and by the internal dynamic of the civil space sector's evolution towards commercial 'maturity'. The thesis examines the interface between the state and both the military and civil sectors, as well as their own interactions, and reveals how the state has encountered problems of power and control in its relationship with the military and scientific/industrial agencies managing the implementation of space policy.

In the late-1980s and early 1990s, space activities on the European collaborative level and on the national French level came to be increasingly questioned as economic recession caused ever closer scrutiny of the costs involved. In France this coincided with attempts by government to reform the relationship between the national space agency - the *Centre national d'études spatiales* (CNES) - and the state, and with increased interest by the armed forces in the spatial modernisation of French defence. The making of French space policy was thus in a transitional period.

CONTENTS

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1. Introduction

One of the particularly interesting features of French space activities is that until recently, no-one seemed to be actively against them, in contrast, for example to government indifference to space and public ignorance of space activities in Britain. More accurately perhaps, there appears to have been a consensus in France in favour of space born of the lack of debate in public opinion and of the enthusiasm and influence of pro-space lobbies. Such tacit support for space activities from French popular opinion was notably demonstrated in the mid-1980s by a survey conducted for the 1985 *Ecole Nationale d'Administration* conference on space. This reputable Gallup poll revealed that 85% of those questioned felt that France should participate in the conquest of space, in comparison with a lower but still positive figure in favour (54%) in 1979. 39% of those questioned were in favour of a tenfold increase in funding for French space (as opposed to 52% against).[1]

This positive attitude on the part of the French public towards space seems to have been a fairly permanent feature of the popular conception of space policy during the later 1980s, since an opinion poll conducted by the *Ireq* consultancy in May 1990 found that 80% of those questioned found it still acceptable after the end of the Cold War that France should spend money on space and that 90% felt that space would bring important techological advances to France.[2] 75% of correspondents thought that space was important for French trade and 70% felt that space would in general be profitable for France, whilst 'only' 60% felt that it was important in maintaining jobs. More generally, space was seen to be a good thing for French and European prestige.(90%), and, in terms of the image of the state in directing this popular activity, 85% felt that the state was playing a competent rôle.[3] Throughout the 1980s therefore, it would seem that French space indeed enjoyed a positive image in popular opinion, being considered 'worthwhile' in a variety of ways, important and generally prestigious. However, the Ireq consultancy poll of May 1990, although showing the faithfulness of the French public to their country's space effort, was nevertheless somewhat behind the evolution of informed opinion on space, which, while still considering French space policy to be important was less convinced than French citizens overall that it was being made in an appropriate and competent way.

In this Introduction we will firstly address the issue of the real importance of space to France (as distinct from its importance in the eyes of the general public), and secondly examine the interest of French space to students of French politics and

secondly examine the interest of French space to students of French politics and society, before moving on to discuss the aims and scope of the thesis in its investigation of the making of space policy. We will then set out the methods, sources and plan of the thesis.

The plan of this chapter will thus be the following :

- **1.1.** The importance of space to France
- **1.2.** The importance of space to analysts of French politics and society
- **1.3.** The aims and scope of the thesis
- **1.4.** Methods, sources and interviews
- **1.5.** Plan of the thesis

1.1. The importance of space to France

Space has been and still seems to be important to France for a variety of reasons, of which the foremost are firstly a concern for the development of French science and technology in general (a large proportion of the funding for which goes to space), secondly a concern for the maintenance of the technological credibility of French defence through space and related technologies, and thirdly, a concern for prestige conferred through high profile high-tech achievements. We shall look briefly in turn at each of these three motivations for France's interest in space, before discussing how the French attitude to the importance of space can be expected to differ from that of the superpowers.

1.1.1. High-tech industry and space

Modernisation - of the economy, of the political system, of society in general - has been a recurrent (if not constant) concern of government in France, arguably since the Enlightenment and the Revolution and certainly since the latter part of the nineteenth century, when defeat by Prussia and industrial competition with Britain and Germany led the French to consider their weaknesses to be the result of outdated structures of production and thought.[4] A belief in the contribution to be made to modernisation by space as a high-tech sector is part of the background to France's enthusiasm for space activities.

Post-1945, under the Fourth Republic, government interest in modernisation of society and the of economy become even more committed as

the Liberation and its ideals of social reform were conjugated with the necessity for reconstruction and a change of Constitution. Furthermore, the rise of technocracy within government and bureaucracy provided the state with an élite with whom to modernise infrastructures, production and society.[5] The Gaullist régime of the early Fifth Republic (1958-1969) reinforced the will of the French state towards modernisation through its concern for Grandeur, by forcing France to compare herself with the most successful and most advanced nations in the international community and by attempting to emulate their performance in industry, science and all other fields. De Gaulle's *'certaine idée de la France'* initiated the full development of the military and civil nuclear programmes, encouraged French science and technology to attempt to attain independence in computer technology, and of course stimulated the nascent space sector through orders for missile launchers.

In the 1980s, in terms of science and industry, the French and European reaction to the SDI programme was not limited to perceiving it as solely a military-strategic threat, and an indirect strategic threat at that. The potential scientific, technological and industrial implications of SDI were understood very rapidly (President Mitterrand's proposal of the EUREKA programme signalled the reaction of European industry), and the desire to avoid the creation of a 1960s style *'défi américain'* in high technology is evident.[6] The belief that prosperity comes through efficient industry (and increasingly high-technology industry in particular) has led to a high level of awareness in France and in other European countries that high technology industries such as space are apparently more than ever essential to the well-being of society in the face of the combined technological-economic imperialism of the United States and Japan. On the level of the European Communities' action, this realisation is evidenced by the proliferation of Research and Development programmes in information technology, telecommunications, biotechnology and other fields.[7] Industrially and commercially, the late 1980s and early 1990s have seen the movement of national economies in Europe towards the single market of 1993 and the constraints upon national industrial solutions that Union implies. There is debate over whether Maastricht and European Union will signify the final death of *'l'exception française'* - the characteristically French approach to state intervention in science and industry that was characterised in 1966 by the OECD as 'a special relationship', the go-it-alone economic policy of 1981-83 and most generally, the *'dirigisme'* and *'étatisme'* that has been supposed, since Colbert, to inform French industrial policy.

Below, we turn to a discussion of the importance of space for French defence.

1.1.2. Defence and space

In the post-war decades to the late 1960s and the creation of France's missile-borne nuclear deterrent, military interest in space was a simple matter of encouraging French technologists and industrialists to develop and produce the necessary ballistic vectors and electronic guidance systems. After something of a pause during the 1970s, the 1980s witnessed a reactualisation of concern over space-based and space high-tech aspects of warfare. The world of the post-SDI declaration was more than ever concerned with questions of the efficacity of defensive and offensive space-based systems, and the effects their development and deployment may have on the scientific and defence capabilities of specific nations. For France, the threat of 'Star Wars' menaced the credibility of the independent nuclear strike force (the *Force Nucléaire Stratégique*, or FNS), and thus led to considerable debate over the need for and the opportunity of modernisation of the nuclear and spatial components of French defence policy. On the military-strategic level, post-Cold War developments in European security have led to reassessments of the rôles of the French and British deterrent forces and of their spatial elements. The Gulf war in 1991 also taught France that state-of the-art space telecommunications and intelligence-gathering systems were increasingly necessary for the French armed forces if they were to retain their autonomy of decision and action, and that she needs to accelerate her military space programme and to develop more satellites, either nationally, in limited collaboration or on a fully European scale.

1.1.3. 'Grandeur' and space

The notion of Grandeur, as applied specifically to France, connotes in general terms the adherence to *'une certaine idée'* of France which magnifies her importance in the world, or at least maintains that France has a special rôle to play in the international system.[8] The literature review that follows looks at a number of analyses of Grandeur and of the theory of the symbolic nature of politics which give a theoretical background to this aspect of space activities. The essential feature of the notion of Grandeur which leads it to be included in our study is the fact that it contains elements which can transcend the normal cost-benefit criteria of political decision-making in public policy. In this way, Grandeur as a motive for

certain choices of government can be useful in explaining phenomena which on first analysis seem paradoxical or contradictory. This is not to say that it can, or will be called upon as a *deus ex machina* to resolve problematic issues.

The application of the notion of Grandeur to the space programme is of course derived from the links established between the development of the *Force de frappe* and the original Gaullist interpretation of the Grandeur of France as based essentially on military independence. In the 1970s and 1980s however, it came to be increasingly recognised that prestige would be created for France through her mastery of civil space applications otherwise associated uniquely with the superpowers. In 1986 the catastrophic effects of the Challenger Shuttle disaster[9] on the American space industry deprived satellite constructors and users of this launch facility and thrust the French/European rocket Ariane into the limelight of space as a commercial sector, emphasizing France's (apparent) technological advance.

It is tempting to overstate the potential rôle of Grandeur as a link between government and high-technology in France, but any reasonable hypothesis about the functions of space in French government and society must accept that space sector activities have both practical and symbolic efficacy.[10] France's characteristic concern to create and maintain 'grandeur' and her particular geo-strategic position in the international system makes her interest in the acquisition of prestige and influence through the space effort correspondingly idiosyncratic in comparison with the motives of the superpowers.

1.1.4. The singularity of France and space

France's experience of her space effort cannot be straightforwardly compared with that of the United States, or with that of the Soviet Union, nor assessed according to the same criteria. France's development of her space effort has always been undertaken *in reaction* to the space activities of the superpowers, and has never been a policy of simple across-the-board emulation aimed at recreating a 'mini' U.S. space sector in France whose successes, costs and constraints would be susceptible to the same criticisms applicable to Nasa, and in the same way. The example of the Ariane programme shows how France's aims in space have been to acquire credible autonomy in 'strategic' technologies and to exploit the errors of Soviet and US space policy.[11]

If the stimulus in the 1960s to de Gaulle's development of a space capability was the American and Soviet Sputnik-induced space race, and if the 'model' of development that existed for French space planners was indeed that

provided by Nasa, France was nevertheless not 'competing' with the U.S. or the Soviet Union. France's competitors or peers in the second division of space activities were initially Britain, and then, with the abdication of British interest in space capabilities independent of the U.S., her partners in the European space science and technology organisations.[12] In the 1980s and 1990s, as the 'third space power', France's near-competitors and near-peers in space are essentially still those countries in the second division - the European nations of the ESA, emerging space powers such as India, China, Japan and Brazil - who came late to the development of their space industries, whilst the U.S. still represents world leadership in space technology.[13] It is because of this 'difference' of ambitions between the American and French space efforts that it is subtly misleading to apply the traditional criticisms of the U.S. space programme to the activities of either CNES or the ESA.[14]

As Walter A. McDougall has pointed out in his 'political history of the Space Age', the American space effort has been handicapped since its inception by its responsibility for protecting the non-communist world against Soviet aggression.[15] This burden of responsibility, and the complications which it has entailed for Nasa / DoD relations illustrates one of the subtle 'differences' between the French and U.S. experiences of space which also presents some similar features between the two enterprises (although on close examination the difference is greater than the similarity, at least for the past and recent period). Like the U.S. space programme, French space was initially heavily (and is still, but to a lesser extent,) involved in the development of military space capabilities ensuring the credibility of French nuclear deterrence or French military autonomy in general. During the period of the 1960s, (and also, but to a lesser extent, in the 1970s and 1980s) it can be said that the French military space effort was concerned solely with providing an umbrella for *France* (with all the cost and technical obstacles this implies for a medium-sized nation), but since the strategic upheavals of the late 1980s and early 1990s, however, the geo-diplomatic door has been opened for the extension of French military space expertise to Europe as a whole.[16]

This example illustrates two divergences between apparently similar structuring conditions of the French and American space sectors. Firstly, U.S. policy was determined by a total West-East military-strategic rivalry with the U.S.S.R. and the necessity of leadership in a bipolar contest, whereas French programming was informed by what may be termed 'sufficiency' vis-à-vis either of the space/nuclear superpowers. Secondly, American policy has been consistently 'national' with unavoidable international responsibilities, in contrast with the purportedly 'European' committment of the French space effort and its

truer more narrowly national ambitions. In comparison with the U.S., France can be argued to have enjoyed some advantages in the politics of its space system, despite some problems caused by greater cost constraints, since French national expertise and capabilities in space have been able to feed on European space activities and funding whereas the US space effort has always relied on national funding but with the implicit responsibility for the defence of the whole 'free world'.[17]

The relationship between the French state and its space sector is not the same as the relationship between British governments and the British space effort, nor is it even the same as that between Bonn/Berlin and German space activities. The bottom line of French space programmes is ultimately geo-political and 'geo-diplomatic', and France's geopolitical concerns are determined by concerns which are arguably special to France, by considerations of her place in the world or her 'rank' in the international community. France's policies are informed by an underlying desire to express French national pride in French genius, but are applied to reality in a context which is dominated by the 'relativity' of France's material and financial means, and by the 'relativity' of her technological achievements in space compared with those of the U.S.[18]

1.2. Importance of the topic for analysts

The French space effort or programme and the policy which determines the development of French space activities (however we call them) are of interest as a topic for academic analysis for a number of reasons, of which three concern respectively the size, nature and performance of the programme. The topic is of importance because the intensity of French interest in promoting the space sector is a characteristic feature of France which distinguishes the country from other European nations. The topic is of importance because the traditional nature of French govenment has been centralising, Jacobin and technocratic and the state's relations with an agency are of interest for the light they throw on the development of government and its approach to public policy. The topic is also of importance because of the difficulties encountered by the space sector in its 'mature' period of the late 1980s and early 1990s and the way in which changes in the attitude of government towards space activities and the space agency may indicate changes in the nature of the French state's traditional characteristics. In the following three short sections of the Introduction we examine these aspects of the importance of French space as a topic for analysis.

1.2.1. Space as a feature of *'l'exception française'*

France is well-known for her space programme, and it is well known that France has a space effort which places her high in the rankings of 'space powers'. In the Gaullist period, France's proud claim to have become, and then to remain the world's third space nation, mirroring the prestige of her nuclear achievements, was a reflection of the prestige that such a position conferred. More recently, in the 1970s and 1980s, it is arguable that the simple chauvinistic motivations for France's investments in space activities have declined somewhat in favour of a greater variety of justifications, but nevertheless, the space effort, and France's leading position at the head of the non-superpower space nations are still features of France's difference, or '*exception*'.

More detailed consideration of French spending on space (specifically the funding for the space agency) will be given in following chapters, but here the singular position of France's commitment to space within Europe and in comparison with a wider range of spacepowers is illustrated by some simple comparative statistics :

European Space Expenditures 1991

Country	Space expenditure (MAU)	Space expenditure as % GNP	Space expenditure per cap. ($)
Austria	22.3	0.0136	2.94
Belgium	97.8	0.0496	9.94
Denmark	22.2	0.0171	4.31
Finland	7.1	0.0056	1.42
France	1220.0	**0.1018**	**21.63**
Germany	802.0	0.0513	10.34
Italy	656.0	0.0572	11.49
Ireland	5.0	0.0115	1.34
Netherlands	93.5	0.0326	6.25
Norway	23.4	0.0222	5.55
Spain	96.6	0.0183	2.46
Sweden	73.4	0.0309	8.70
Switzerland	46.3	0.0203	7.00
UK	205.9	0.0203	3.60
Total Europe	3371.5	0.072	14.3

(Source :European Space Directory 1993, Sevig Press, 1993)

As can be easily calculated from this first table of comparative figures, overall French space expenditure for 1991 represented 36% of total European spending. French expenditure was 50% higher than that of Germany, the second largest

spender, and twice that of the third largest spender, Italy. Per capita, and in terms of % of GNP devoted to space, France's singular position amongst her closest European neighbours is even more marked, since she spends proportionately twice as much on space as Germany and Italy. French enthusiasm for space stands in stark contrast to the United Kingdom's meagre financial outlay, which amounts to 6% of total European spending, a fifth of France's spending proportionate to GNP and one sixth of French spending 'par citoyen'.

As the leading spender on space in Europe, and the leading country in the ESA, France is demonstrably in a different league to her European comparator nations. In comparison with other space powers, the value of her spending on space may seem less exceptional, but proportionately to population and national wealth, France's commitment to space still sets her apart, as the next table of figures shows :

Space expenditures - France, UK, USA, Japan (1991)

Country	Space expenditure (US$)	Space expenditure as % GNP	Space expenditure per cap. ($)
France	1220.0	0.1018	21.63
UK	205.9	0.0203	3.60
(Total Europe)	(5030.5)	(0.072)	(14.3)
USA	29828.0	0.529	116.1
Japan	1154.7	0.034	9.3
USSR	?	c1.0	?

(Source :European Space Directory 1993, Sevig Press, 1993)

Total French spending on space in 1991 was thus slightly greater than that of Japan, despite Japan's significantly larger GNP and population, bu only one quarter that of the United States. In fact, the comparison with the US is the only one where France does not come out on top, but as we have already argued, the French space effort is not really to be compared with those of the US and the ex-USSR, since it should be considered different in nature.

1.2.2. French space and the concept of the '*grand programme*'

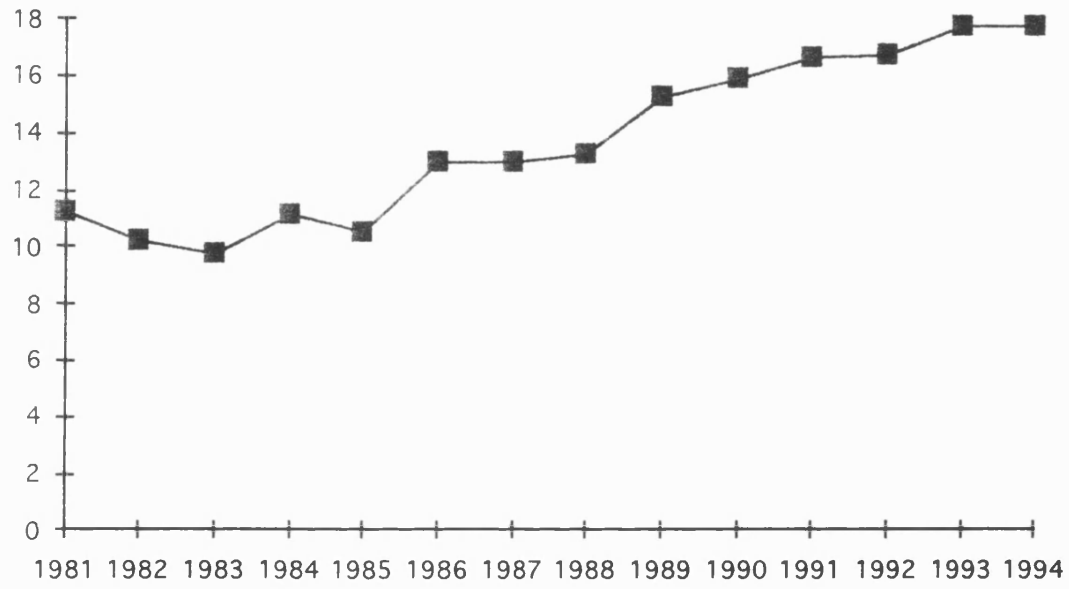
The French space effort and French space policy provide analysts with an interesting case study of a characteristically French public policy approach: the

grand programme.[19] The concept of the *grand programme* itself actually predates the creation of the *Centre national d'études spatiales* (CNES), or French national space agency, in 1961, so we will look first at the idea and then at its practical manifestations in the form of the Space centre. The expression *'grand programme'* has traditionally been used in France since the Second World War to describe a particular form of state intervention in technologies of industrial and economic importance. Fundamentally, the intervention thus described is characterised by the newness of the technology involved and by a number of qualifications concerning the nature of the technology. Naturally, not all new technologies in France become the object of *grand programme* action. To qualify as a potential candidate for a *grand programme* , the technology therefore has to be new and to be deemed of great socio-economic interest, as well as being beyond the reach of unaided market forces. Although the technology itself is new, the work required in a *grand programme* is essentially developmental rather than pure research (or *'prospective'*). The way in which the *'grand programme'* approach to public policy has been applied to space allows conclusions to be drawn not only about this particular application, but also about the French state's approach to public policy in general.

The *grand programme* approach generally involves the creation by the state of agency organisations entrusted with the responsibility of carrying out the *grand programme* in question for government. The institutions and individuals entrusted with the execution of the programme have necessarily to exercise both technical and administrative competence in the development of the technology. In a sense they mediate between the technology and the political authority represented by the state's desire for development and results. Because of their special rôle and responsibilities, these scientific 'technocrats' are generally grouped in a single organisation created by a law entrusting it with the mission of carrying out the programme. This organisation is generally an *Etablissement public à caractère économique et commercial* (EPIC), of which CNES is arguably the major example. EPIC organisations usually have two principal distinguishing features. Firstly, they are theoretically independent of centralised financial control (for example interministerial discussion of the science/research budget), since their budget allocations are decided outside the normal circuits of spending department annual budget negociations. Secondly, the EPIC is generally the sole interlocutor between the state and the industry of the technology under development. Such features of autonomy and monopoly of expertise tend to give rise to problems of power and control in state-agency relations.

A final feature of space as a *grand programme* is the burden it places on state funding for civil science and technology funding. State spending on space will be examined in detail in subsequent chapters, but the graph below gives an indication of how space has been absorbing a high and increasing percentage of overall government civil research and development funding (*Budget civil de recherche et de développement* - BCRD) :

CNES state grant as % of BCRD



(Source : adapted from CNES and French govt. statistics)

1.2.3. Space and the French approach to modernisation

The final aspect of the French space programme which is of interest to analysts is that examining space policy may allow insights into the French approach to modernisation. In the French debate over modernisation, one can distinguish a number of major themes. Three of these themes are the modernisation of *society*, the modernisation of *industry*, and the modernisation of the *state*. In the field of public policy, attempts to bring about these different kinds of modernisation may coincide chronologically, as during the Fourth Republic, and particularly the Fifth Republic when new technocratic methods of government were combined with a new Constitution and a desire to escape from the social, industrial and economic backwardness which had contributed to France's defeat in 1940 and plagued

reconstruction after the Liberation. Policies of modernisation may coincide in the fields to which they are applied, for example the modernisation of French industry and technology which was stimulated by de Gaulle's vision of French independence in the 1960s also contributed to the modernisation of French society through a transformation of attitudes towards science and technology in general. In the late 1980s and during the 1990s a major concern of government in France has been the rôle of the state in society, and more specifically, the extent to which the state should be present in all areas. This concern is usually discussed in terms of an opposition between *moins d'état* ('less state') and *plus d'état* ('more state'), or in another formulation, *l'état modeste* versus *l'état ambitieux.* The rhetorical solution to this particular conundrum is usually that there should be *mieux d'état* ('better state'). *'L'état ambitieux'* is the classic *dirigiste* French state intervening in society, industry and science in voluntarist fashion, whether directly or through an intermediary scientific/industrial institution such as a national space agency. The concept of *'mieux d'état'* in the context of state-agency relations reflects government concerns to foster efficiency in its management at one remove of important and costly sectors such as space. The injection of a qualitative aspect into the debate (*'mieux d'état'*) fits well with the idea of progress that the state is supposed to represent and nurture. The notion of 'better state' also dovetails with the policy that is intended to bring it about, namely the modernisation of public administrative structures and practices or '*la modernisation administrative.*'

The *grands programmes* and the agencies which run them occupy an interesting intermediate position between government and the state on the one side and industry and society on the other. *Grands programmes* and EPICs enjoy a measure of autonomy from the state, since they are set up by the state to manage long-term initiatives whose technical parameters escape the normal expertise of government and whose financial requirements go beyond the normal budgetary procedures. *Grand programme* agencies such as the *Commissariat à l'énergie atomique* (CEA) and the *Centre national d'études spatiales* are 'overseen' by government through the channel of *'tutelle'* or ministerial supervision. Technical *tutelle* is exercised by the ministry or ministries whose responsibilities are seen to be the most closely linked with the activities of the agency and its programmes. Indirect financial *tutelle* can also originate from the Finance ministry. Because of the complex and varied nature of the activities which make up the overall space effort, the *tutelle* for CNES has often been divided between ministries and has often switched as governments reshuffle their ministerial portfolios. Such a 'fluidity' of the tutelle for the space sector has perhaps

contributed, along with the considerable capacity of CNES to propose policies to government, to a situation in which the regulatory and evaluatory control of the space agency has been somewhat lacking, and where 'modernisation' of the relationship between state and EPIC is required.

The late 1980s and early 1990s have seen a progressive questioning of the activities of CNES and the space sector, as evidenced initially by a number of critical official reports on the space sector. In the perspective offered by Dyson (1986) on state action and its motivations in the communications sector, it is possible to see an interest on the part of the state in inquiry into the activity of a given sector as an attempt to impose authority over it within a context of brokerage politics. The immediate motivation for such a concern in the late 1980s in the space sector is the cost of the French space effort and the perceived monopoly of technical expertise enjoyed by CNES rendering difficult the controlling activities of the sector's tutellary authorities.

Because space seems to be particularly important to France, and because an analysis of the French approach to what can be thought of as an example of French 'exception' is a useful contribution to our knowledge of France, research into the making of French space policy should be of interest to students of French politics and society.

1.3. Aims and scope of the thesis

The agencies, actors and organisations which interact in various ways to produce what is perhaps simplistically termed French 'space policy' form a highly complicated system of forces whose overall coherence has sometimes been questioned. The thesis aims to describe and examine these agencies, actors and organisations and analyse their making of policy in both the civil and military sectors of the French space effort. Through revealing the reality of the processes at work in what is commonly assumed to be a monolithic, self-contained 'space programme' led by a similarly well defined 'space policy' we hope to show the real complexity of the French space effort.

The ambition to look at a broad range of factors which enter into the definition of the French space effort, (and thus of space policy in the most comprehensive sense of the term), naturally precludes a single-discipline investigation of the problem. Such a single-discipline study might well be appropriate for looking at party political differences over space policy in France or

for researching the reaction of the French financial community to the need for rocket and satellite insurance schemes; a narrowly sociological enquiry for example might look at the social and educational background of major decision makers in the space sector. Such examples illustrate three possible studies of the making of French space policy on the 'micro' level of investigation, but this thesis aims to look at policy-making in a wider perspective.

Space entertains a complex relationship with government precisely because of the varied nature of inputs to overall space policy, which range from military, industrial, scientific-technological and prestige concerns to, (increasingly), financial and budgetary constraints on space funding. In addition to this multiplicity of inputs, the particular status of the agencies set up in the early 1960s to manage the civil space programme and the French arms industry has further complicated the definition of policy and the conduct of individual programmes by providing independent sources of expertise on space technology.

For these reasons, the thesis concentrates on examining the activities of the civil and military space sectors, in order to demonstrate how overall space policy is constructed from a variety of sources and for a variety of motivations. The thesis looks at the French national space agency CNES and examines its rôle as an EPIC leading a *grand programme*, what its activities are and how they are funded, and how it interacts with government. The thesis also examines the elaboration of 'military space policy' in the Defence Ministry, the *Etat-Major des Armées* (EMA) and the *Délégation Générale pour l'Armement* (DGA), and shows how military and civil space co-exist in practice and in policy.

The 1980s are the essential period of interest for the thesis. Discussion of space policy is not restricted exclusively to this period however, since in order to understand contemporary developments, there is a need to compare the 1980s with earlier situations. The choice of the 1980s is not moreover merely dictated by a desire to study this particular decade: the years between 1979 and 1988 represent the development of CNES and space policy initiated by the 20 February 1979 *Conseil Restreint sur l'Espace* which decided to reform CNES and to produce and commercialise Ariane, and the 1988 modifications of Ministerial responsibility for CNES and the reforms of the PTT. From 1988 to 1991, these reforms were set in motion, only to be complicated by the Gulf War, by economic recession, by cabinet re-organisations and by a change of government

Without elaborating the issues of political science raised by Kolodziej's ideas on the élite/non-democratic nature of the arms industry[20] or the philosophical fears expressed by Ellul about the 'absurdity' of the technological system as a whole, which might both apply to some extent to space,[21] premonitory

disquiet about the logic of the French space effort was resumed by the French space practioner and analyst André Lebeau in the following terms: *'Encore faut-il que cette logique à long terme soit maîtrisée et explicite. Or, le moins qu'on puisse dire est qu'elle ne l'est guère actuellement, tant la technique spatiale présente davantage les apparences d'une force qui va que celles d'un phénomène soumis à une intention stratégique.*[22] Lebeau's implicit concern was that the internal dynamics of the space sector were neither transparent nor totally controlled by the state, which would wish even more to shape the space industry (military and civil) in ways furthering its own governing credibility. Through an examination of the various agency, government, strategic and cost 'logics' which drive the making of policy and the development of the space effort, the thesis aims to provide an understanding of the 'coherence' of policy and of the 'accountability' of policy makers.

What the thesis does not aim to do

The study does not intend to give an exhaustive treatment of the economic and financial aspects of the French space sector, neither does it intend to limit its enquiries to the single issue of the military-civil interface, fascinating as these topics are in their own right. The thesis does not aim to exhaustively present the relationship between public and private in the space industry any more than it pretends to deal with the distinctions to be drawn between purely national and European space ventures. Elements from all of these fields are obviously integrated into the research and analysis, but the interdisciplinary and synthetic nature of the enquiry (and of space) preclude extreme detail in any of the contributing issues. The aim is to combine analyses of different but related issues. The thesis assumes as background to its analysis of the domestic national mechanisms of policy inspiration and formulation that space activities are generally accepted to be 'high-tech', and that France is involved in European and other international cooperation in space.

1.4. Methods, sources and interviews

To understand the multiple facets of space activities and space policy, it is necessary to look at analyses of 'grandeur', defence and high technology, theories of the state, of public policy and technocracy, of science and industry policy and at the official documentation produced by the space sector, as well as interviews with

practioners and experts in an attempt to obtain inside information. The multifarious nature of the sources and of the interviews conducted in the course of the research for the thesis reflects the complicated nature of the issue in question.

1.4.1. Methods

Methodologically, the nature of the subject being investigated has had obvious consequences for the approaches adopted in fieldwork research, both in terms of interviews and to a lesser extent in the acquisition of documentary information. In the military sphere, the confidentiality of many aspects concerned with the nuclear deterrent and with the development of space strategy has constrained official readiness to divulge matters which are classified *'confidentiel défense'*. However, there is sufficient material accessible in the public domain which, when combined with information gleaned from personal interviews and research, gives a comprehensible picture of the realities of what is hidden behind official rhetoric. It is perhaps worth stressing that numerous analysts of French arms industry issues and of French high technology have bemoaned the relative 'impenetrability' of the arms-aerospace-high tech complex, ranging from individual scholars and the investigators of the Parliamentary Office for the Evaluation of Scientific and Technological Choices to the authors of the National Committee for the Evaluation of Research's study on space policy.[23]

1.4.2. Sources

Material on French space can be found in a variety of forms, of which the national press, the specialised press, official publications and promotional publications are the main sources. Academic studies of the political implications of French space policy are however relatively few and far between, as the literature review will reveal.

The National press.

Day to day and week to week information on developments in the French space sector can be gleaned from the national press in France and Britain and from the specialised aerospace publications, (mainly British and American), which cover world-wide aeronautics and space matters. The British press deals with French space questions under such varied headings as 'European news' and 'Science and technology'. The principal sources are The Financial Times, The Times, The

Independent and The Guardian. The Economist provides an habitually succinct occasional weekly coverage. In France of course, *journal de référence oblige*, *Le Monde* covers space sector developments under a variety of rubrics reflecting the complexity of the issues involved. Commmentators such as Jean-François Augereau, Maurice Arvonny, Michel Colonna d'Istria, Jacques Isnard et al report on space on the 'Science', 'Research', 'Aerospace', 'Business' and 'Defence' pages. Of the other national dailies *Libération* provides a customarily refreshing slant on matters under the headings of 'Space' and 'Science', whilst *Le Figaro* gives a generally somewhat sensationalist treatment of events. Of the weeklies, *Le Point* and *L'Express* have devoted special reports to French space activities.

Below, we consider the specialised press.

The Specialised press.

This general journalistic coverage is complemented by the more detailed and technical treatment given by the specialised professional weeklies. These magazines are essentially concerned more with the strictly aeronautical aspects of aerospace but have developed expertise on space technologies and politics. Thus Aviation Week and Space Technology has reports devoted to space technology, commercial space, SDI, and satellite communications as well as occasional longer features on items such as Soviet space advances, and European launch program recovery. Flight International covers space matters under the headings of defence, spaceflight and industry, as well as headline treatments of events and themes such as Ariane launches and ESA projects. Aerospace America has lesser coverage in the relevant sections 'Space science' and 'Aerospace Europe'. Spaceflight, the monthly organ of the British Interplanetary Society, deals with space news and prospective projects as well as publishing occasional articles on aspects of space policy by experts such as Roy Gibson. Interavia aerospace review (published monthly in English, French, German and Spanish versions) also has occasional coverage of space matters. The European Space Agency produces two publications dealing with its activities: the ESA Journal contains scientific and technical material while the ESA Bulletin is aimed at a slightly wider audience and contains articles on the legal, commercial and financial dimensions of the Agency's programmes. In France, *Air et Cosmos* is the only equivalent of the English language aerospace weeklies along with *L'Aéronautique et l'Astronautique*, but reports and comment on

government decisions and space technology are also found in magazines and periodicals such as *Sciences et Vie, Sciences et Avenir, La Recherche* and *Sciences et Techniques*.[24] Of these, the most serious reporting is found in *La Recherche*, whose coverage of space is assured by Alain Dupas and in *Sciences et Techniques*, which deals with the industrial aspects of space applications.

To a certain extent all these sources belong to what might be termed a 'space lobby'; they are therefore 'interested parties' as far as any evaluation of the objectivity of their analyses is concerned. It must nevertheless be pointed out that their treatment of space matters is generally well-balanced, although with a tendency to favour more rather than less funding for any given project ceteris paribus. Their main contribution is in the factual detail that they provide on contemporary developments.

Official sources of information

Information about CNES is found in the Centre's own Annual Reports, pamphlets and newsletters such as *La Lettre du CNES* and also in documents published by *La Documentation française*. Information about the DGA is presented in its publicity publications produced by the *Service d'information et des relations publiques des armées* (Sirpa) and in armed forces reviews and periodicals such as *Défense Nationale* and *Armées d'Aujourd'hui*. The main source of official documentation tends however to be the parliamentary publications of the *Assemblée Nationale* and the *Sénat*. These *Avis, Rapports* and *Rapports généraux* originate from the multiple *commissions* (or committees) which scrutinise government proposals and culminate in the elaboration of the *projets de Loi* (or bills). The *projets de Loi de finances* for the various ministries involved in space activities are particularly interesting provided that they furnish comprehensible breakdowns of funding (which is not always the case). Particularly revealing, but naturally difficult to obtain are confidential documents from government, such as the *Rapports confidentiels annuels - Industrie* compiled by the *Ministère de l'Economie et des Finances*, to which access has nevertheles been obtained.

Other sources.

Other sources of information come from a wide range of quasi-governmental and commercial publications. Quasi-governmental sources include the trade

organisations *Prospace, Novespace* and GIFAS which publish promotional material on the aerospace and space industries. Purely commercially orientated promotional material is produced by *Arianespace* and *Spot Image* and by all the major space sector firms such as *Matra,* SEP, *Aérospatiale* and *Thomson.*

Comment on the orientations of space policy and on the factors which combine to determine the direction of the French space effort are to be found occasionally in a wide variety of journals, of which only the major ones can be mentioned here. Space Policy deals with all aspects of space matters, but seems curiously devoid of articles discussing specifically French aspects of space matters. Space Markets deals with the more strictly commercial details of satellites and launchers. Military considerations on the role of space are covered in France by a number of journals of which the most influential are *Défense Nationale, Stratégique* and *Etudes polémologiques* (since October 1990 merged with *Stratégique*). The implications of space activities for international relations are occasionally analysed in *Politique Etrangère,* The World Today and International Affairs, and, less frequently, in other international relations journals.

1.4.3. Interviews

The interviews, numbering some thirty in total, were conducted over the period October 1987 to May 1993. Most of the interviews took place in Paris, as this is the seat of most high-level non-technical authority in the management of the space sector, although a useful opportunity to discuss matters informally with representatives of various commercial and state space organisations was afforded by the Bordeaux *Technospace* Trade Fair in December 1988. Similarly in December 1988, the Western European Union (WEU) Conference on Scientific and technical aspects of arms control verification by satellite provided a more general forum for discussing military space matters than formal interviews with DGA and EMA officers and other Defence Ministry officials. The table overleaf gives a list of the main interviews conducted while researching the thesis. The list is not exhaustive, since it gives only the principal interviewees of meetings with administrators, armed services officers and analysts, where other informants were often also present.

Interviews 1987-1993		
Name/rank	**Position / Organisation**	**Interview date**
Dominique David	Directeur de la Fondation d'Etudes pour la Défense Nationale (FEDN)	November 1987
André Brigoux	FEDN	November 1987
Hélène Arnaud	CERI/Sciences Po. Paris	November 1987
Yves Boyer	Institut Français des Relations Internationales (IFRI)	November 1987 (telephone)
Colin Cameron	Western European Union (WEU)	6 December 1988
Bruno Petit	Contrôleur général des Armées/Ministère de la Défense	9 December 1988
IPA Roger Peuron	Service d'information et de presse des armées (Sirpa)	14 December 1988
Martin Boyle	Scientific Attaché, British Embassy in Paris	3 February 1989
Alain Simon	Conseiller pour les Affaires militaires/CNES	9 February 1989 and 24 May 1993
Daniel Pichoud	Ingénieur général des Armées/ DGA	2 March 1989
Amiral Bonnot	Secrétaire général de la Défense nationale/SGDN	13 April 1989
Colonel Ferrère	SGDN	13 April 1989
Colonel Eleu de la Simone	Division Plans-Programmes-Espace/EMA-Ministère de la Défense	19 April 1989
Lt.-Col. Bouchard	Plans-Programmes-Espace/EMA	19 April 1989
Daniel Sacotte	Directeur du Cabinet du ministre / MRT	26 May 1989
Amiral Sanguinetti	Retired	1 September 1989
Jean Gruau	Inspecteur général / CNES	22 November 1989 and 24 May 1993
Françoise Praderie	Département Terre Océans Environnment Espace (TOEE)/MRT	13 December 1989
Dom. Vidal-Majdar	TOEE/MRT	13 December 1989
Christophe Frank	Administrateur à l'A.N, Service de l'informatique, de la prospective et du développement technologique	3 April 1990
Edwige Bonnevie	Conseiller pour les Affaires stratégiques DGE/DGA	3 May 1990
Michel Glass	Délégué général adjoint / DGE	28 May 1990
Jacques Serris	Délégué général adjoint / DGE	28 May 1990
Alain Joxe	Directeur d'études EHESS	(By telephone) June 1990
Régine Thomas	Coordination générale Olympus, Ministère des Affaires étrangères	14 June 1990
Marc El Nouchi	Responsable du bureau Espace, Recherche, PTT / Direction du Budget-Ministère des Finances	3 July 1990
Eric Preiss	Direction du Trésor, Ministère des Finances	23 September 1991
Pierre Claret de Fleurieu	Administrateur au Sénat, membre du Secrétariat de l'OPECST	21 April 1992 and 25 May 1993
Laurent Fourquet	Responsable du bureau Espace., Recherche, PTT / Direction du Budget-Ministère des Finances	25 May 1993

1.5. The Plan of the thesis

The thesis comprises three main sections: the first section contextualises recent and current developments in the making of French space policy analytically, historically and practically, and sections II and III examine these development in the civil side of the sector (I) and the military elements of the space effort (II). The concluding chapter of the thesis is an 'evaluation' of the significance and importance of changes in the making of policy during the 1980s and early 1990s and comment on how the latest developments reflect on the direction of the space programme. Overall, including this introduction, the thesis is made up of eleven chapters, which in more detail, have the following content.

Chapters Two, Three and Four of the first section set out the background to the making of French space policy in the 1980s by examining the academic and other literature dealing with or related to space (Ch. 2.); by presenting the history of the French space effort as it developed during the 1950s, 1960s and 1970s from military dominated origins to cooperation between civil and military (Ch. 3.), and by analysing the structure, major firms and markets of the French and European space 'industries' as they stand now (Ch. 4). Chapter Two, in reviewing the literature of various kinds which informs an academic understanding of space in France looks at analyses of '*grandeur*' and high-technology as a background to much of the motivation behind French space policy, examines theories of the state and of French public policy, assesses the contributions of studies of science and technology policy in France to space and looks at the most important of the official oversight reports which have criticised the managment of the space sector. Through the variety of the topics which it investigates, the Literature review underlines the pluridisciplinarity of the perspective of this thesis to an issue - the making of space policy - whose analysis appeals to many different explanatory approaches.

Chapters Five, Six and Seven of the second section of the thesis consider the relationship between the civil space agency CNES and government, examining CNES' rôle as a semi-autonomous state agency, its organisation, objectives, activities and funding (Ch. 5.), and how government has interacted differently with the Centre at different times during the period 1979-1992 (Chapters 6. and 7.).

Chapters Eight, Nine and Ten of the third section of the thesis consider the military aspects of the overall French space effort, and how inputs from defence

strategy (Ch. 8.), the organisation of space bodies and planning in the military establishment (Ch. 9.) and military-civil collaboration in industry (Ch. 10.) inform the making of military space policy.

After Chapter Eleven, which provides the concluding analysis of the making of policy, there follow a Glossary of abbreviations and acronyms, Appendices detailing minor CNES subsidiaries not examined in the main body of the thesis and CNES Statute documents. These statute documents bring together all the laws, decrees and government regulations which have governed and currently do govern the space agency's activities. The final component of the thesis is the Bibliography.

We will now move on to examine previous literature on French space activities and other related topics in the **Literature Review**.

Notes to Chapter 1.

1 L'Espace, un défi pour la France, Actes du Colloque, Association des anciens élèves de l'ENA, Paris, 1986, pp.10-20. CNES also undertook a study of public awareness of the space programme in 1979-80 which was less enthusiastic about space, this difference prompted a remark at the ENA conference that CNES had *'bien fait sa propagande'* (André Lebeau, in L'Espace: un Défi pour la France, p.72.).

2 Ireq, L'image des activités spatiales auprès du grand public (Ireq, Charenton, July 1990).

3 *Estimez-vous qu'en France, l'Etat remplit bien ou mal son rôle en matière d'activités spatiales ?*

Très bien	*73%*	
Plutôt bien	*12%*	*85%*
Plutôt mal	*10%*	
Très mal	*3%*	*15%*
Sans réponse	*2%*	
Total	*100%*	*100%*

Adapted from Ireq, L'image des activités spatiales auprès du grand public (Ireq,Charenton, July 1990).

4 For example Ernest Renan's La Réforme intellectuelle et morale, published in 1871 after France's defeat in the Franco-Prussian war and the events of the Commune, and also Claude Digeou's, La crise allemande de la pensée française.

5 The *Ecole Nationale d'Administration* (ENA) was created in 1945 as a training institution for the elite of a modernised technocratic civil service.

6 *'Le défi américain'* was a term coined in the 1960s by Jean-Jacques Servan-Schreiber to describe the challenge posed to France by US technological superiority. See Servan-Schreiber, Jean-Jacques, Le défi américain, Denoël, 1967.

7 ESPRIT, RACE, FAST, COST, COMETT etc.

8 The expression *'une certaine idée'* comes from General de Gaulle: *'Toute ma vie je me suis fait une certaine idée de la France... Le sentiment me l'inspire aussi bien que la raison'*, Mémoires de Guerre: l'Appel 1940-1942, Plon, 1954.

9 Challenger Shuttle disaster, 28 January 1986. Thus during the mid-1980s, the French space industry received two stimuli to development: SDI in the military sector, and increased demand for Ariane launches in the civil sector.

10 In terms of 'Grandeur', although the break up of the Soviet Union and the consequent weakening of the Soviet space effort has promoted the French national space programme to the status of second only to that of the USA, the reunification of Germany has created financial problems for the European Space Agency's collaborative ventures. The cost of reunification to be borne by Bonn has provoked reluctance from Germany to continue past levels of funding for ESA programmes such as Ariane V, Hermès and Colombus, and France's strong industrial stake in the development of these systems has been threatened with loss or spiralling costs for France.

11 In the case of Ariane, the US error was the 'all shuttle' decision, which even without the grounding of the shuttle post-Challenger disaster led to over-costly launches for satellites and enabled the French (and Europeans) to exploit this niche in the space sector.

12 More latterly, with the development of an space effort independent of US licensing, Japan has also started to become a competitor.

13 Only in certain specific activities, such as Ariane, do France and Europe purport to 'compete' in space with the U.S., either in terms of technical achievements or in terms of services provided.

14 The French desire in the 1960s to apparently 'go it alone' in the nuclear and space sectors was a function both of de Gaulle's distrust of the Americans and of the fear of a 'technology gap' between

Europe and the U.S.. The readiness of the French state to undertake such an individualistic policy of national technological advance was based on the confidence, shared throughout government, science and technology, that French technocracy was capable of taking up the challenge posed by America's progress in the space race. The special relationship between the French state and technocratic science has been chronicled in Gilpin's classic analysis of French science and technology in the 1960s, (Gilpin, Robert, France in the Age of the Scientific state, Princeton, Princeton U.P., 1968. This special relationship was based in part on the French desire to react to the strategic and technological gap they perceived between them and the U.S. (Recent research suggests that the French may after all have had help from the U.S.)

15 McDougall, Walter A., The Heavens and the Earth: A Political History of the Space Age, (Basic Books, New York, 1985), p.429.

16 In the 1990s France may find herself providing the basis for the spatial defence of Europe, just as the U.S. guaranteed the strategic nuclear defence of the West during the Cold War, with the difference that France will be able to call on technical and monetary assistance from European partners.

17 SDI could be seen in this context as the first attempt by the US to involve other countries in the costs of their own nuclear/spatial defence.

18 See Aubinière, Robert, Réalisations et projets de la recherche spatiale française, Revue de Défense nationale, November 1967, pp.1736-1750. A particularly revealing difference of opinion between the British and the French in the 1960s over their committment to space technology was that concerning the need for launcher (or missile) independence from the United States. The U.K. decision to abandon the Black Arrow programme (and eventually to propose Blue Streak for Europeanisation) announced Britain's position of relying on the U.S. for the space technology necessary for her nuclear deterrent. The French however, whose position was determined by the absence of a natural special relationship with the Americans and by the unnatural animosity created by de Gaulle's views on American hegemony, were obliged to go it more or less alone in the nuclear sector, although recent research suggests that the Americans actually helped the French nuclear programme in the 1970s (Richard Ullman of Princeton) and to cooperate with the U.S. in space only on *satellites*, preferring to develop an autonomous launcher programme.

19 For a treatment of the notion of the *grand programme*, see P. Cohendet and A. Lebeau, Choix technologiques et grands programmes civils (CPE/Economica, 1987).

20 Kolodziej, E. A., Making and Marketing Arms, Princeton, 1987.

21 Ellul, J., Le Bluff technologique, Hachette, 1988.

22 Lebeau, A., Vers l'expansion de la technique dans le système solaire ?, Le Monde Diplomatique, (January 1987), pp.8-9.

23 Interview, *Office parlementaire* administrator (21 April 1992). See also Chesnais, François, (ed), Compétitivité internationale et dépenses militaires, CPE/Economica, 1990 for criticisms of the unwieldy nature of French National accounting statistics, and McLean, Alasdair, Western European Military Space policy, Dartmouth, Aldershot, 1992, p.6. (A rather thin treatment of French military space), and *Comité national d'évaluation de la recherche*, (CNER), Evaluation du programe spatial français (1992).

24 Since 1989 known as Sciences et technologies.

Section I LITERATURE, HISTORY AND ECONOMIC BACKGROUND

In the first major section of the thesis we review the literature (Ch. 2.), the history (Ch.3.), and the economic background (Ch.4.) to French space.

2. Literature review

This thesis seeks to fill a gap in the literature dealing with French technology and government in recent decades. The gap is created both by the scarcity of French academic studies of the French space effort and by the rarity of works aiming to explain the making of French space policy to the wider French or British public. The analysis of French space policy that we set out in this thesis relies thus (at least initially) on an eclectic range of sources and approaches. This pluridisciplinarity is the result of two characteristics of the issue in question; firstly the wide-ranging complexity of space policy, and secondly, the general nature of the literature already devoted to certain aspects of French space activities.

The available literature can be classified in two main ways; by subject matter and by the nature of the publication involved. This classification is made necessary by the absence of a closely defined body of literature dealing specifically with space policy, by the range of approaches and sectors in question, and by the rapidity with which developments can occur.[1]

The themes and concepts that the thesis explores have been presented in the Introduction. As individual fields of enquiry they form the main body of the literature review. This chapter will thus deal with the five fields of study whose analyses have to be drawn together and applied to the wider issues raised by an investigation of the making of French space policy. These fields of study and the plan of the chapter are thus the following :

- **2.1.** The symbolic nature of politics and the concept of 'Grandeur'
- **2.2.** The state and public policy in France, and technocracy
- **2.3.** Industrial policy in France and modernisation.
- **2.4.** The organisation of French science and technology
- **2.5.** General analysis of French space activities and 'oversight reports'
- **2.6.** Conclusion

These 'fields of study' will be discussed in the order in which they appear above. This order reflects a movement from the most general background to the making of space policy (symbolic politics and grandeur), through theories of the French state and its organisation of industry, science and technology, to the most specific analyses of French space activities.

2.1. The symbolic nature of politics and the concept of 'Grandeur'

The ambition of this review of literature on symbolic politics and grandeur is to show the variety of 'prestige factors' which create the general background to the development of high technology activities such as the nuclear industry and the space effort. It is against this backdrop that French space policy is made.

2.1.1. The symbolic nature of politics

Standing behind much of the literature on Grandeur is the notion of the symbolic use of politics, to use the title of Murray Edelman's 1946 work on this subject.[2] An initial quote from Edelman can go a long way to showing the essence of the concept and its relevance as a background to our concerns: 'Political forms thus come to symbolise what large masses of men need to believe about the state to reassure themselves. It is the needs, the hopes, and the anxieties of men that determine the meanings. But political forms also convey goods, services and power to specific groups of men. There is accordingly no reason to expect that the meanings will be limited to the instrumental functions the political forms serve.'[3] As Edelman goes on to stress, his book is about the capacity of political forms to serve as 'means of expression' for 'mass publics' and the ways in which they accord benefits to particular groups. For Edelman, the conventional study of politics looks at how people get what they want through their relations with government, whereas his analysis 'concentrates on the mechanisms through which politics influences what they want, what they fear, what they regard as possible, and even who they are'.[4] There is no implication, at least in the early stages of Edelman's analysis, that elites manipulate political myths and rituals to serve their own purposes, but as the arguments are developed it becomes evident that there is an (at the least) ambiguous relationship between areas of political myth and groups related to those areas. Thus 'Administrative agencies are to be understood as economic and political instruments of the parties they regulate and benefit, not of a reified "society", "general will", or "public interest". At the same time as they perform this instrumental function, they perform an equally important expresssive function for the polity as a whole: to create and sustain an impression that induces acquiescence of the public in the face of private tactics that might otherwise be expected to produce resentment, protest and resistance.'[5] Such an idea may well be applicable to the activities of the French national space agency.

We will now move on to look at three well-known approaches to the concept of Grandeur which go some way to linking it with some of the concerns relevant to our enquiry into the making of French space policy. These three treatments of Grandeur deal with its relationship with international policy, security, and the internal and external ideological effects of a foreign policy based on Grandeur. In order of publication they are: Edward A. Kolodziej's French International policy under de Gaulle and Pompidou: the politics of Grandeur, (1974)[6]; Philip G. Cerny's The Politics of Grandeur. Ideological aspects of de Gaulle's foreign policy,[7] (1980); and Michel L. Martin's 1981 Warriors to Managers: the French Military Establishment since 1945 [8]

We will look at Kolodziej first, then Martin, and finally Cerny.

2.1.2. Grandeur and Technology - France as a Middle-range Power ?

Kolodziej looks at what he calls French 'global policy'[9] during the period 1958-1974, a policy aiming to change patterns of alignment and power relationships between states. Global policy is presented as a broadly based activity combining strategic, economic and diplomatic policy areas. Kolodziej sees a complicated two-way relationship between these specific, concrete policies and 'larger' global aims. Thus France's global policy is 'a means of achieving its narrower national foreign policy goals',[10] just as the global aims are an object of French foreign policy. An interrelationship that is not analysed in any depth is that between domestic and foreign policy, except to the extent that in the study 'relevant domestic constraints on policy are noted'.[11] The study is placed firmly on the level of national, intergovernmental relations, rather than spreading into the ramifications of personal, group, or corporative connections. Such relationships are perhaps increasingly characteristic of space cooperation between the various space agencies of the European countries and between space and electronics firms both within, and increasingly outside, industrial consortia.

It is in the treatment of *technology and Grandeur* that Kolodziej's analysis impinges most directly on our concerns. One of his conclusions, that 'French efforts on behalf of a multipolar international system largely did not produce the results expected by the Gaullists of increasing France's influence, status or independence vis-à-vis the superpowers, its European partners, or Third World states'[12] is justified by France's limited resources and the constraints posed by other countries. The lack of success which France experienced in freeing its foreign policy from 'exterior control' is symptomatic of the 'narrow limits within

which a middle-range power must work to shape its relations with the superpowers'. This argument echoes our belief that as a background to the domestic workings of space policy, the technological ambitions and international cooperation of the French space programme represent in some ways an attempt to escape constraints of limited resources and the rank of a middle-range power.

Much of Kolodziej's brief treatment of technology relies on Robert Gilpin's France in the age of the scientific state, published in 1968, whose contribution to our enquiry will be evaluated later.[13] Although he notes that the French *Force de Frappe* was a strategic response to a perceived security problem justified by 'an elaborate rationale . . . built on military, diplomatic, psychological, economic, technological and scientific grounds'[14] Kolodziej does not really develop the scientific and technological aspects of Grandeur beyond brief expositions of French attitudes towards Euratom and towards possible collaboration with the UK and USSR, and the field of technology is left open to the further research called for in the preface. However, despite these omissions, Kolodziej's demonstration of France's attitudes towards nuclear technology and grandeur suggests that space activities may well be considered to be of similar nature in terms of their military, diplomatic, psychological, economic, technological and scientific motivations, and is thus of interest to us in providing an element of background to the national mechanisms of policy.

Grandeur and modernised security.

Moving on to Michel Martin's Warriors to Managers, whose first chapter is devoted to the consideration of Grandeur and security, we find an analysis somewhat different to that of Kolodziej, at least in terms of the scope of its aims. Unlike Kolodziej, Martin does not seek to present a study of French international policy in terms of sources and goals. Rather, in its treatment of foreign policy Warriors to Managers hopes to 'define the guiding principles, the underlying philosophy...of French external policies in order to suggest the kind of environment in which the roles and tasks of the military establishment were specified'.[15] Taken as a whole, Martin's work is a study of the French military establishment as an organisation being transformed by *the technological modernisation of its forces.*

Martin's conclusion to his sociological exploration of the changing nature of the French armed forces is that change was monocausal - technological modernisation - but that a 'dualistic technological environment'[16] explains variations in the changes wrought in the different armed services. The environment of intensive technological change was created in the early 1960s by

the two upheavals of colonial disengagement and the decision to assume a strategy of nuclear defence. These two changes marked what we might term a shift in the locus of Grandeur. As Martin puts it; 'as the curtain was drawn over colonial domination, it became clear that the country's grandeur had to be nourished from other sources.'.[17] These other sources were independence and military might. Martin argues that by guaranteeing an independent national defence the *Force Nucléaire Stratégique* (FNS) was a means by which the Fifth Republic attained the twin goals of prestige and security.

Martin's analysis thus looks at the effects of the technological modernisation of the armed forces on the structure and organisation of the forces themselves as well as situating this modernisation within the context of wider concerns of Grandeur, security and economic development. Although constantly alluded to as a motor of organisational change, technology is never explicitly illustrated beyond the example of the nuclear deterrent force. In fact, since the 'deterrence logic'[18] is equated with the technological exposure of the armed forces this would appear to be Martin's "technology". Given the importance of this technology as an effective instrument in the achievement of the concerns of the French state it is a pity that its exact nature and effects are not made clearer.

Martin's analysis is of particular interest to the concerns of this thesis since the later 1980s and early 1990s have arguably witnessed a considerable move on the part of the French armed forces to modernise their structures, equipment and thinking, initially under the stimulus of SDI and subsequently as a result of the catalysing effect of the Gulf War. A principal feature of this modernisation has been the development of the space-related aspects of French defence, to such an extent that space has seemed to be becoming a new military 'fetish'.

The domestic purposes of Grandeur.

It is for the links that it establishes between foreign and domestic policy and Grandeur that Cerny's The Politics of Grandeur is of special interest to us. If Martin works within a framework where potentially antagonistic objectives can be reconciled in special circumstances, Cerny's analysis shows how the definition of one objective in special terms can facilitate the achievement of the others. Cerny shows how the pursuit of Grandeur was a function of an ultimately domestic purpose.[19]

Cerny points out that, in general, 'political institutionalisation and economic development' have been taken together as a reified process of 'Modernisation',[20] but that notwithstanding different historical and socio-economic contexts, the

objective of 'authority legitimation' is indispensable for the kind of national integration de Gaulle was seeking to achieve. Foreign policy is the 'specific instrument par excellence'[21] used by elites for this purpose. This is because of the nature of foreign policy affairs: to be involved in them means that one must be a nation-state; foreign policy is nebulous and remote and can only be evaluated with difficulty by the individual; and foreign policy issues 'transcend the complexities of the relationship between the individual and the state'. Thus foreign policy can play this ideological role because 'in addition to its remoteness and its symbolic potency... it appears to escape the zero-sum perceptual framework of the allocation-of-resources problem which dominates domestic politics.'.[22]

In the conclusions of his 'framework for analysis', Cerny sets out the context of de Gaulle's pursuit of Grandeur: 'In a world where opposition no longer takes the form of a clearly defined conflict situation, but rather operates, as it were, according to a complex matrix of forces, foreign policy leadership becomes a key locus for symbolically charting a course through these forces - or at least, in the symbolic sense, for being seen to be courageously and independently attempting to chart such a course.'.[23] The way in which France was involved in the institutional aspects of this matrix of forces constrained Gaullist moves to maintain strategic and economic independence to limited symbolic areas. At the same time, France's ability to work within the system constraining her independent action - the FNS in the context of bi-polar strategic balance for example - increased the symbolism of Gaullist policies.

Cerny's analysis of the politics of Grandeur is based on the Atlantic Question, which, as he points out is a case study rather than a wider study of all the arenas of French foreign policy activity. Other potential case studies suggested by Cerny are; monetary relations between France and the USA; the German problem; the recognition of China; and French attitudes towards the UN. The Atlantic question is an issue-area which combines different elements of the Grand Design, as is made clear by the introduction of the 'specific policy area' of science policy as an example of possible contradiction between policy goals. The example Cerny gives is taken from Gilpin's France in the Age of the Scientific State, illustrating how France engages in cooperative science projects as supplements to her national programmes, for instance in the space sector. These contradictions and paradoxes do not ultimately endanger the Grand Design since the overall dynamic of the pursuit of Grandeur is seen to be coherent. Nonetheless, our study of the complexities of the making of space policy within France seems to fit well as a

contemporary 'specific policy area' against the background of Grand-Design issues.

The explicit treatment of the issue of science and technology in The Politics of Grandeur is limited to a short section devoted to a discussion of weapons and technology in the context of Franco-American relations. Here again, as in Kolodziej, considerable reference is made to Gilpin. France's ambition, created by a desire to possess independent nuclear forces and US refusals to help with technology was to achieve independence in nuclear technology and related defence capabilities but also in government-supported scientific research in general.[24] For Cerny, 'The symbolic significance of the FNS ... goes well beyond its impact on science, technology or even defence *per se*. It also symbolises a new authority structure'.[25] More generally, the 'military and space programmes'[26] had a symbolic (Gilpin stresses psychological) effect on French society and its modernisation. Social, economic and institutional effects facilitated France's metamorphosis into an advanced industrial society. Taking Cerny's analysis of nuclear technology as a background to the present state of interaction between French government and technology, we would argue now that the French space programme in the 1980s was torn between an 'heroic', 'symbolic', 'Grandeur-orientated' rôle in French society inherited from the 1960s and (to a lesser extent) from the 1970s, and a new 'mature' phase in its development based on realistic assessments of its military, technological and economic utility to the nation.

Making and Marketing Arms.

Edward A. Kolodziej's 1986 contribution to the analysis of the ideological functions of the arms industry in the Fifth Republic is of considerable interest here. His Making and Marketing Arms, the French experience and its implications for the International system[27] follows on in many ways from his earlier 1970s study of the French approach to Grandeur, but by focusing on a specific sector of industrial and commercial activity he concentrates his analysis on the relationships between these activities and the 'ideology' lying behind French government actions. Thus he examines the links between the arms sector, national independence, military autonomy and the emergence of a new world order in the Fourth and Fifth Republics. He discusses the nexus of influences linking 'Arms' and the Welfare State, and 'Arms' and the state itself, and investigates the effects of the politics of arms transfers on the 'arms oligarchy' and democratic norms. Kolodziej approaches the issue of arms production and arms sales since 1945 within a twin

perspective framework. The first of these perspectives is the effect of a strong arms sector on the place of France within the International system, and the second concerns the influence of successful arms production and exports on the very political institutions of the Fifth Republic.

Within the context of making and marketing arms as a tool of French systemic designs on establishing France's position internationally as more than just another medium-sized power, Kolodziej's argument is that France's rôle as a major arms supplier 'has contributed to multipolarity, giving it [France] legitimacy and voice in a Gaullic idiom'.[28] Especially in the Fifth Republic's experience, France's inability to encourage the decentralising, multipolar trends of international relations has created a situation where 'the transfer of arms and military technology is still the preferred instrument of French international policy'[29]. This is fundamentally because 'It accords well with an autonomous military strategy...and it is consistent with welfare goals and efforts to bolster France's economic position'.[30]

In terms of the political legitimation of the government of the Fifth Republic, Kolodziej states that 'The stability of France's governing institutions and the very legitimacy of the French Fifth Republic have been progressively linked since 1958 to the success of French arms and arms sales'.[31] This legitimation of the political structures of contemporary France is closely linked with the modernising rôle of the arms high-technology sector on France's industry and society. 'Making and marketing arms' combines a variety of both domestic and external government objectives, as Kolodziej implies; 'The political support and legitimacy of the Fifth Republic also partially depends on the ability of a new leadership class to maintain a competent arms industry capable of simultaneously servicing France's welfare, security and foreign policy goals and of motoring the modernisation and the reform of French society'.[32]

Setting aside any wider moral considerations, such a situation is however, not without its disadvantages, despite the efficiency with which the production and sale of arms contributes to the overall welfare of French society. Kolodziej identifies the domestic dangers of *entrenched élites and of businesss and bureaucratic interests in the arms industry,* whose essentially private, corporatist concerns have to be reconciled with the objectives of the state for itself and for France. Similarly, on the external level, the model of behaviour presented by the French experience of arms is in fact creating the conditions for an undermining of the independence and autonomy of action that arms transfers have traditionally aimed at achieving. This is because in the short-term France's security interests become functions of world markets in arms technology, and in the long-term, the

imitation by developing countries of France's example of exploiting the arms industry and arms sales undermines both the markets and the strategic balance of the multipolar international system fashioned by France to her advantage. Kolodziej's conclusion is thus that the success of making and marketing arms carries within it the seeds of its own failure as an enduring aim and instrument of French policy.

The symbolic nature of much of the politics of high-tech sectors is a well recognised element in much consideration of the relationship between the French state and science and industry. The surprisingly restricted amount of study devoted to the space sector, (although explained by the traditional interest of commentators in the French nuclear adventure, both military and civil), has become increasingly aberrant in the 1980s as state funding for the civil space and nuclear sectors (for example) gradually converged. Kolodziej's Making and Marketing Arms is interesting for our study of space in the way that it establishes links between the activities of a high-tech sector and problems of governance, and how strategies may contain the potential for 'dysfunctioning', thereby creating new tensions and difficulties.

As intimated above, symbolic politics and grandeur form a large part of the background to the French space effort in the way they account for many of the original and sometimes enduring motivations of France's interest in space. Edelman's approach suggests how national prowess in space could provide 'belief' in France for a mass public, and also how agency interests might diverge from the initial objectives set by government. Kolodziej, Martin and Cerny show how France has used the nuclear modernisation of her armed forces and her arms industry as instruments of influence and prestige in the international context, but also how they provide domestic political returns. Kolodziej's later study also hints that such strategies may also contain potential political drawbacks for the state, for instance through problems with entrenched elites.

We will next examine more closely the literature dealing with some features of the nature and rôle of the French state which can inform an analysis of a national interest in space activities.

2.2. The state and public policy in France, and technocracy

It is useful to set the background to analysis of space sector activities in France - activities in which the French state is heavily involved in terms of policy making and industry - by discussing the nature of the French state, and, briefly, how it may be thought to differ from other models of government and society. We will then move on to consider the relevance of concepts of 'technocracy' to the study of space policy.

2.2.1. Dyson's theory of the state

The standard treatment of the modern Western state is that given by Kenneth Dyson in his The State Tradition in Western Europe (1980). The analysis of the French state that Dyson gives stresses various features which combine naturally to form the background to French attitudes towards the management of the modernising process in industry and society.[33]

For Dyson, France is an example of a 'state society' (rather than a 'market society') characteristic of which are a 'public and problematic role of the intelligentsia' and a tendency to suffer from social stalemate (stalemate society) because of the *inefficiency* of the bureaucratic state. Dyson discusses briefly the Hoffmann/Crozier thesis[34] of France as a stalemate society, in which 'The French state is viewed as combining technocratic arrogance in certain elite corps with a pervasive bureaucratic inefficiency' and where the system is paralysed over long periods of time until charismatic leaders effect overdue reforms. Although he finds this analysis somewhat exaggerated, Dyson accepts that it sheds light on the French 'administrative model of action' which (in contrast to Anglo-Saxon practices) tends to bring about change in society through 'a regulatory interventionist administraton, which claims a monopoly of rationality, with periodic crisis'.

It could be argued that the periodic crisis of such a 'regulatory interventionist administration' occurs at different levels at different times - thus the *société bloquée* of the 1960s saw its crisis in the upheavals of Mai 68, and the blockages of the Post and Telecommunications sector came to crisis and reform in the late 1980s and early 1990s. Likewise, it is possible for us to see the crisis in confidence of government in the space sector of the same period as an example of blockages which the state has been attempting to resolve by the institution of commissions of inquiry and the implementation of reforms.

The action of the state (or how it intervenes in society) is considered by Dyson as part of a discussion of the state as a 'Tool of Analysis', in which the 'generalising', 'integrating' and 'legitimating' functions of the state are evaluated. Dyson stresses the 'existence in France of a philosophy of the state as an integrative conception' which through institutions such as the *Ecole Nationale d'Administration* and the French Planning Commission 'attempt to proselytise "modernising" values as part of a conception of coherent, purposive state action'. Indeed, 'France represents a case of institutional concentration; the bureacracy is the repository of the state tradition'.[35] Further still, because of this importance of the bureaucracy, 'the state tradition has been associated with the idea of a zone of authority independent of the Assembly and the parties and interest groups'.[36] Although such patterns date back both to Colbert and to the Revolution, it is since 1958 that the trend has become particularly striking. During the early years of the Fifth Republic, de Gaulle launched a number of the long-term *grands programmes* of scientific-technological-industrial development, (such as nuclear arms and power and space), which were fostered and directed by state agencies such as the CEA (nuclear) and CNES (space). During the Fifth Republic, government (initially under the stimulus of de Gaulle) has encouraged the implementation of policy through the administration via the gradual replacement of the '*République des Députés*' (and an '*Etat conflictuel*') by an '*Etat gestionnaire*' and *'fonctionnel'* run by the public bureaucracy. Writing from the standpoint of 1980 and persisting divisions between different groups of technocrats, Dyson was relatively sceptical about the extent to which this new '*République des fonctionnaires*' has led to greater cohesion of policy, although he concedes that 'a capacity for public leadership and initiative exists within the French bureaucracy, a capacity to formulate and sustain a policy through to implementation'. However, as he immediately points out, failed policies like that of the *Plan Calcul* are also the fruit of the same technocratic bureaucracy.

The capacity to formulate and sustain policy through to implementation obviously implies public sector structures, whether structures which failed to maintain the French computer industry in the 1960s, which created the nuclear deterrent and nuclear power in the 1960s and 1970s, or which launched and still direct the space industry. As a state society, France is much interested in the different natures and legal characters of these structures or institutions, which form part of the state. The main division between institutions is whether they represent the 'police power' or the '*service public*' element of the state's activities. Refering to Rolland's discussion of the organisation of the '*service public*', Dyson mentions the two main forms of direct provision; either *en régie*, or through an *établissment*

public.[37] Provision *en régie*, is, as Dyson expains it, provision by a part of the general services of the state, but with separate financial accounts, whereas *établissements publics* are 'detached branches of the general services of the state' possessing separate legal personality and financial autonomy.[38] Dyson stresses that in France, the activities of the public sector in general and of *établissements publics* in particular are considered in relation to 'an idea of the inherent functions of the state and a body of public law relating to the state and its organs'. The French national space agency is an example of an *établissement public.*

Despite the traditional intervention in industry by the French state, and the close linkage between the idea of the state, extensive public sector industry and the concept of 'public service' activity, Dyson also warns that 'doubts have emerged about the capacity of the centralised state apparatus to handle the problems of a an increasingly complex industrialised society that has been subjected to new competitive pressures from the international market'.[39]

Our interest in this part of Dyson's theory is that it is this capacity of the state in its various European forms to cope with contemporary developments in high technology industry and the international economy that seems currently in question in such sectors as telecommunications, aerospace, defence and computers. The evolution of the sectors (threatened by competition from Japan and by recession) in terms of their internal dynamics and characteristics and the changing international context tends to lead to conflicts of interest between different sectoral actors and the state.

The French national space agency is just one such example of an *établissement public à caractère industriel et commercial* which in terms of its statutes and the spirit of public law and 'public service' which informed its creation should be a model of indirect provision to society. However, in the framework drawn up by Dyson and the idea that the early Fifth Republic entrusted programmes to state bodies acting in tandem with corporatist interests, it is possible to see that the make-up of CNES as a corporatist body of engineers and 'scientist administrators' nowadays produces conflicts between state and corporate interests, and between state and sectoral manager (CNES), because the sectoral manager may have been 'captured' by sectoral interests and interests of state and industry are no longer compatible.

In a sense, the analysis of theories of the state (and the patterns of government intervention that they reflect) given in The State Tradition forms the theoretical background to the more practically oriented analyses of European communications policy that Dyson and Peter Humphreys have made and edited in

the 1980s.[40] In particular, Dyson's opening chapter on 'West European States and the Communications Revolution' in The Politics of the Communications Revolution (1986) is useful for the light it sheds both on the confusion of government responses to changes in telecommunications and on the confusion of analyses of the sector :

> *the responses of West European governments to the communications revolution seem to display little consistency at the level of either ideology or policy, for instance towards deregulation or European collaboration. At the same time, behind the articulation of rhetoric and doctrine - the displays of symbolic politics that often serve to disguise a sense of political unease - a common and less heroic process of relearning the arts of statecraft is underway. Communications policies, and the theories underlying them, are not being analysed and assessed in their own right as technical issues by government. They are being accepted or rejected or changed as instruments of a fundamental political strategy - to regain a governing competence and to maintain ideological and governmental credibility.*[41]

Dyson examines three competing theses about the evolution of communications policies; the first is that changing national policies reflect the change and development of international markets, the second that they reflect the interaction of governmental political ideology and domestic policy sectors, and the third that they represent a changing relationship between the law and politics in Western Europe.

Not unsurprisingly perhaps, a mix of these different theses on the evolution of policy emerges as the most satisfactory general explanatory perspective, *with the proviso* that the 'main bias' of government policy is nevertheless isolated. The 'main bias' that Dyson identifies is 'governments' problems of policy implementation as they find themselves caught between new external forces and more turbulent domestic politics in communications . . . government's search to re-establish a governing competence along with maintaining its ideological credibility. Government is motivated by threats to the autonomy of state action and consequently its ability to act effectively'.[42]

The analytic tool that best reveals the 'main bias' of government action is the study of the policy process, or the second of the competing theses. For Dyson, the policy process approach allows an appreciation of what he terms 'statecraft', and draws attention to the role of ideology and issues of identity in policy; 'The perspective of statecraft helps us to isolate the specifically political rationale behind policy choices'.[43] In the study of the communications sector, 'the specifically political rationale' encompasses such features as the use of deregulation to deal with 'overmighty subjects' or 'failed national champions', and can explain cross-national collaboration and domestic pooling of efforts as a

means of countering 'the enemy from without' (in other words US technological, economic and cultural hegemony).

In the communications revolution, Dyson sees stages of policy described by him as 'From heroism to brokerage'. 'Heroism' consists of state enthusiasm for the introduction of the new communications technologies and the encouragment of policies and industry to obtain this. The later stage of 'brokerage' reflects the eventual need for government to trade off different interests against one another and to reassert its own inflence over competing sources of authority such as national champions. Symbolic politics and legitimation strategies can be seen as a supplementary weapon for the state in its action to manage the development of the sector, and a means of compensating for the loss of credibility entailed in the setting up of new commissions of inquiry or new regulatory bodies.

The concept of statecraft is useful in our consideration of the action of the French state in the space sector. Although less important in commercial terms than the communication sector and its various actors, the space industry, CNES, the DGA and the various other organisations involved in the space sector represent a non-negligeable aspect of technology and industry for governments concerned with national competitivity, prestige and budgetary rigour. The mechanisms of ministerial direction, *tutelle*, and inspection arguably display features of the transition from 'heroic policy' to brokerage politics identified by Dyson in the communications sector, and this is an issue which will be discussed later in the thesis .

2.2.2 Technocracy and space

'Technocracy and space' is essentially the bottom line of Walter A. McDougall's studies of what he terms the 'Political history' of the 'Space age'. The major exposition of these ideas was given in The Heavens and the Earth: A Political History of the Space Age , published in 1985. During the preparation of this longer study, McDougall addressed two particular aspects of the politics of space technology in two articles appearing in 1982 and 1985 respectively. These articles reflect themes developed in The Heavens and the Earth and are worthy of brief presentation.

In the first of these articles, 'Technocracy and Statecraft in the Space Age - Toward the History of a Saltation', McDougall introduces the idea that the advent of Sputnik and the consequent development of the Space age operated a change in the relationship between states and technology. [44] The 'saltation' referred to in the article's title describes the 'abrupt discontinuity' within the gradually increasing

importance of science and technology for governments which 'transformed governments into self-conscious promoters, not just of technological change but of perpetual technological revolution'. [45] In describing the literature on the impact of space technology on International politics, the political rôle of science and scientists, the relationship of the state to technological change and political culture and values in nations of high technology (or what he defines as 'the loci of revolutionary change in the space age'), McDougall concludes that the contradictory claims of those who denigrate space activities and those who claim they have effected a transformation of state-science relations need both to be moderated. [46]

Central to the analysis is the notion of 'technocracy', which is defined as 'the institutionalisation of technology for state purposes, involving the organisation and funding by the state of a national infrastructure for the acceleration of technological change on the assumption that its own foreign and domestic goals will be served by the products of such change'.[47] Technocracy was the theory and the means by which the state was supposed to lead scientific and technological development in the Space age, and apparent American success in so doing led other countries not directly involved in the Cold War and the Space Race into starting their own space programmes. Justifications for this emulation of the U.S. involved strategic considerations (for example the French desire for independent deterrence), but Mc Dougall stresses that 'the univeral impulse to involvement in space was economic'.[48] The massive state committment to the promotion of science and technology was, for McDougall, the cause of a change in the nature of the state - or as he puts it: 'if complex new technologies are sponsored by the state itself, then the state, whatever its ideology, becomes "revolutionary". '.

Such a change in the nature of the state leads regimes to try to "socialise" 'new systems' in ways which strengthen their own position. At this point in his argument, McDougall evokes Gilpin's use of the example of de Gaulle's ambitions to regain France's grandeur through technology, '*without ceasing to be France*'.[49] This example is used to suggest that Gaullist technocracy was used as an instrument of domestic politics, enticing the French into legitimating the Fifth Republic by a "captivating vision" of France in the year 2000. The idea that technocracy is a tool of internal politics also leads McDougall to ask whether it reveals 'the emergence of a "revolutionary centrism" offering technological, not ideological or social, change to play midwife to a future as secure and bountiful, but less threatening, than that offered by either a socialist Left or a laissez faire Right.'.[50]

In considering the failure of this technocratic promise, 'Technocracy and Statecraft' recognises the real difficulty of measuring the effects of space age technology, and the divisions of opinion between those who saw the space race as 'ceremonial waste', and those who maintain that space technologies can have high benefit-to-cost ratios. McDougall believes that what he terms 'the journalistic debate on fall-out from the space program', (or was the non-stick pan really worth it ?) has diverted attention from the real impact of the space effort, namely 'The role of space research as the intellectual, institutional, or financial progenitor of revolutionary developments in micro-miniaturisation, computers, optics, materials processing, robotics, lasers, solar power cells, and more . . . The advent of the technological fix, streamlined large systems-management techniques, compromise of values embodied in once autonomous social institutions, the dominance of government by political and social engineering . . .'[51] In the current context of 'perpetual and rapid progress', McDougall asserts that all states have become "backward" on a permanent basis, and that 'leading nations justify their ever-accelerating pace of innovation by the need to maintain military and economic security' despite the fact that this progress may 'undermine the values that make a society worth defending in the first place'.[52]

Having presented relevant aspects of the literature on public policy and technocracy, we shall now investigate what has been written on state intervention in industry concerning French high-tech in general and, where possible, French aerospace.

2.3. Industrial policy in France and modernisation

The overall debate over liberalism versus *étatisme*/statism/*dirigisme* in France in the late 1970s and throughout the 1980s informs part of the general background to the management of the space effort. The space sector cannot simply be explained however by considering it as a simple expression of industrial policy or of science policy, the nature of space activities is, as we have already suggested, more complicated. The debate on whether France is dominated by statist intervention in the economy has tended to focus primarily on high-technology industry policy, arguably the single general field of public policy most similar in its concerns to the space sector.

2.3.1. 'We can make the Ariane, but we can't make washing machines'

Taking the recent studies of Rand Smith, Green, Gourevitch, Cohen and Hayward, it can be seen that commentators stress a number of common features in their discussion of the statist/liberal divide.[53] The underlying common features are firstly trade and economics, secondly industrial policy and technological dependence, and thirdly modernisation. The overlying common features that these analysts identify as complicating the solution of the problems of trade, industry and technology are the dilemmas of élitism versus democracy, and the difficulty for France of attaining independence in an interdependent world economy.

Most commentators identify a gradual trend away from the strictly traditional interventionist French policy *à la Colbert* : Rand Smith identifies a move in the 1980s away from classic sectoral industrial policies to what he terms 'environmental' policies targeting firms and industry in general rather than specific companies and sectors.[54] Diana Green sees Socialist measures to favour IT as an example of 'the difficulties of reconciling the instinct for *dirigisme* with the economic and political imperatives of liberalisation'.[55] Gourevitch characterises the French approach as essentially 'neo-mercantilist', a formulation which does perhaps best reflect the natural tendencies of French high-tech companies, the *grands corps* techniques and the political establishment.[56]

If shift away from traditional *dirigisme* there has been, then the move has been effected under two different pressures, firstly that of conforming with the patterns set in the international system, and secondly, the realisation that traditional planning and state-led development of sectors is 'naturally' inappropriate in certain high-tech sectors such as IT. Rand Smith's study, (aptly entitled for our purposes 'We can make the Ariane, but we can't make washing machines'), concludes finally on the 'ineptness' or ill-adaptedness of the hand of the state in industrial performance. Cohen highlights the confusion and bewilderment of Giscard/Barre policies for 'managing a good recession' in the late 1970s, their avowedly liberal policies only serving to reinforce the étatist model of economic policy.

Where the state has been successful indeed is in sectors where the activity has been shielded from the market, such as the nuclear power programme or telecommunications. In these activities, at least until the recent past, the traditional methods of *dirigiste* intervention have retained a degree of efficiency, although, as the example of IT provided by Diana Green shows, the telecommunications sector will soon no longer be protected from market forces

and from the rapid changes so inimical to succesful state management. The state has also been able to apply liberalism as a prop to its *dirigiste* tendencies, thus for example the appeal to the theory of liberalism legitimates the designation of priority sectors in a competitive market, tacitly legitimating at the same time the state's measures to protect the sectors in the national interest. Conversely, for sectors such as steel, liberal theory can be used to justify the implementation of run-down policies and the refusal of government aid.

2.3.2. 'High-tech Colbertism'

The regular "waltz" of the *pédégés* (or frequent change of heads) of state owned companies and the apparent abandonment of the so-called *'ni - ni* principle' of neither privatisation nor nationalisation by the Rocard government served to remind us in the early-1990s of the importance in France of state enterprise and of the continuing debate over the future of the French approach to the *'économie mixte'*. [57] Two of the major challenges facing French industry and technology are arguably the rigours of competition in the European Single Market and criticism of the place of traditional French approaches to 'industrial policy' within an integrated (and generally liberally inclined) European economy. Two contributions in 1991 and 1992 to the ongoing analysis of French and European high technology by Cohen, de Boissière and Warusfel illustrated differing viewpoints on the place of "voluntarism" in industrial-technological development.[58]

Elie Cohen's Le Colbertisme high-tech looks at the traditional French desire to marry the encouragement of high technology and economic common sense, and concludes that past practices are in fact nowadays detrimental to the attainment of the objectives of independence and modernisation conventionally assigned to high-tech industrial projects such as Concorde, the TGV and the Minitel. After his earlier studies of the exercise of power of and in industrial groups and following examinations of the motivations and success of State intervention in the modernisation and crisis of French industry, Cohen now branches out into a consideration of various *'grands projets technologiques'* as examples of *'le colbertisme high-tech'*.[59]

Of the many definitions he gives of high-tech colbertism, the following best illustrates Cohen's approach; *" Le colbertisme high-tech est la forme historique qu'a prise l'intervention de l'Etat-nation armé du monopole de l'intérêt général dans ses relations avec les industries dites de pointe de l'après-guerre à nos jours".* This vision of state intervention in high-tech industry and the structures it implies are now to be considered as inappropriate in a system of mature high-tech sectors

in which, moreover, government action is limited both by the insufficient proportions of purely national economies and by the political obsolescence of such patterns of state intervention.

Such a conclusion concerning the current perniciousness of modern-day "Colbertism" is based on Cohen's interpretation of the example of the state-led modernisation of the French telephone system in the 1970s and 1980s and of other attempts to implement copy-cat growth and improvements in other related fields of telecommunications such as cabling, satellites and the *Minitel*. Cohen identifies High Definition TV as a project on a European scale susceptible of serving as a test case for the extension of France's colbertist model of high-tech intervention to the European level. The problems inherent in the HDTV project (described as *'une polyphonie désaccordée'*) illuminate for Cohen the way in which France would be wrong to try to impose on European technological cooperation a form of intervention which is ill-suited to anything but a nationalistic ambition for the success of domestic champions and scientific and commercial prestige.

The French space programme, which is our particular interest, is of course another example of high-tech colbertism which may well experience the same problems identified by Cohen in the programmes he examines.

In La Nouvelle frontière de la technologie européenne, De Boissière and Warusfel, in a treatment of more or less the same phenomena, but from the viewpoint of European, rather than narrowly French technology, reach the conclusion that *'une Europe qui aura préservé son autonomie sur un nombre significatif de créneaux porteurs sera en mesure de continuer à écrire elle-même son propre avenir'*. Being able to define her own future, (as the authors put it) is not the same as being independent - the best-case scenario still possible for Europe is *'l'autonomie dans l'interdépendance'*, or freedom of manoeuvre within a world economic system dominated by American and Japanese technology.

Through an analysis of the successes and failures of European technology since the 1960s (Euratom, Unidata, Ariane, Airbus, Eureka, Esprit, HDTV etc), de Boissière and Warusfel demonstrate their scepticism concerning current EC led technology programmes such as Esprit and nationally inspired initiatives such as Eureka. Moreover, in the pessimistic assessment they present of current European strategies, when the deficiencies of such technology programmes are compounded by the negative effects (as they see them) on overall European competitiveness of the Single Market, Europe will go down the path of technological (and ultimately political) dependency. It is for these reasons that

technology is seen as the 'frontier' to be defended in order to protect European society and culture.

The strategy for protecting European technology that the authors advise is *'une action conjointe sur le marché, les structures et la société qui peut seule permettre à l'Europe de mettre en oeuvre un modèle original et efficace de développement technologique'*. Past failures in European attempts to promote technology have in this analysis been caused not by any inherent and ineradicable weakness in the technologies in question but by the application of inappropriate and incomplete strategies. De Boissière and Warusfel criticise what they see as current reliance within Europe on market forces as a manager of technological development, and identify the Single Market as a potentially fatal blow to Europe's technological future. By acting as an inappropriate continental version of *'hyper-libéralisme anglo-saxon'*, 1993 will create risks of weakening European independence through increasing the EC's permeability to technological competition.[60]

If *'régulation concurrentielle'* or *'stratégie de marché'* is a necessary but not sufficient element of a successful European technology promotion, what more is needed ? De Boissière and Warusfel propose what they call *'stratégies de structures'* and *'stratégies de société'*. Adapting the terminology of the economist François Perroux,[61] the authors distinguish between *'effet de structure'* and *'emprise de structure'* together describing the existing organisational structures of industry nationally and in its links with industry abroad, and *'préférence de structure'*, or the preferred industrial structure to be attained through voluntarist political action. Europe must thus implement a policy of *'préférence de structure'* which will safeguard her technological autonomy. This of course is industrial policy by another name (de Boissière and Warusfel propose the term "macro-management"), a concept apparently regaining some credibility within the EC Commission and in France, (did *dirigisme* ever really suffer in France under the influence of the *"vague libérale"*?), as the authors underline with a quote from Roger Fauroux, Michel Rocard's Industry minister.[62]

'Stratégie de société', or the third element of Europe's overall strategy of technological development is the most idiosyncratic feature of La Nouvelle frontière de la technologie européenne, and perhaps the most typically French aspect of the analysis, appealing as it does to more philosophical notions such as *'la technologie dans les têtes', 'l'immoralité technologique'*, 'democracy', 'freedom' and 'responsibility'. The gist of the concept is that technology must be used for *'le service de l'homme'* and *'le combat pour un nouvel humanisme'*.

Leaving this somewhat nebulous idea behind, we are left with de Boissière and Warusfel's recommendations for technology in Europe, namely a combination of international market forces and a *'préférence de structure'* - or strategic political-bureaucratic (technocratic?) regulation on a Community-wide scale rather than nation by nation.

It is here that the weakness of de Boissière and Warusfel's argument appears, since despite the detail and insights into the successes and failures of French and European technology which form the basis of their study, their conclusion is essentially uncontroversial and seems to fudge the issue of the real balance to be established between market forces and central implementation of a *'préférence de structure'*. Cohen, admittedly with the advantage of publishing a year later than de Boissière and Warusfel (fashions tend to swing in thinking on these issues) seems to come down more decisively against the transposition of high-tech Colbertism from the French national level to the European arena, at least in part because he sees the European Commission as more durably against industrial policy than do de Boissière and Warusfel. Another advantage of Cohen's analysis is that he identifies the full subtlety of the French position over European high-tech industry.[63]

Cohen's study also seems to incorporate the argument of La Nouvelle frontière de la technologie européenne that some form of intervention is always desirable by considering *'la rhétorique industrialiste'* as a periodic reassertion of now illusory Nation-state ambitions, rather than a still justified principle of public policy. In echo of Michel Crozier, whose ideas on Etat moderne, Etat modeste reputedly informed Michel Rocard's thinking on the modernisation of French government and society[64], Cohen calls for the *'Etat colbertiste '* to become an *'Etat modeste'*.

2.3.3. 'Modernisation'

Reflecting the topicality of the concept in academic and political writing of the early 1980s, the 1985 Conference of the Association for the Study of Modern and Contemporary France was devoted to Modernisation. In the introduction to the Conference proceedings (France and Modernisation), John Gaffney identifies the possibility that the nature of modernisation has changed in the 1980s, reflecting a more conflictual and divisive context within which the process and its policies must protect France's interests : 'the 1980s have taken France, along with the rest of Western Europe, into a technological race in which there will be winners and losers, and which will establish a league table which will inform the political and

social developments of the next century'.[65] Gaffney goes on to describe how there is an agreement in French politics around the concept of modernisation : '. . . all the mainstream French political actors are poised to maintain and accelerate France's position. And *'modernisation' is the unquestioned organising principle of that competitiveness.*' Moreover, 'modernisation' is not only to be measured in terms of France's performance, its ability to compete or cooperate with its economic giant of a neighbour West Germany, or even with its more distant and economically even more gargantuan competitors, Japan and the United States, but in terms of *the strength of the desire for change*, translated now unequivocally for the first time into political orientations and policy initiatives'[66] Gaffney reflects here the contemporary consensus in France over the need for further modernisation and over the place of high technology in the process.

Pascal Petit's analysis of modernisation and the French *economy* since 1945 sees the election of the socialists in 1981 as marking a strong return to the ethos of modernisation after a period in the mid- and late-1970s when, under the pressures of the Oil Crisis, the guiding principle of industrial policy had been 'industrial redeployment'.[67] The failure of this liberally-inspired policy of withdrawal from declining and uncompetitive sectors led the socialists to attempt modernisation through political and administrative decentralisation and, industrially, via a programme of nationalisations accompanied by the reform of labour relations. This policy itself foundered in turn on the economic difficulties caused by France's go-it-alone policy of expansion in the early 1980s, which led to the application of financial 'rigour' and France's return to monetary and macro-economic orthodoxy. It is from the mid-1980s that one can date what Petit describes as 'Modernisation's new clothes' or a 'paradoxical response to the challenge of the "will to modernise". Petit's view is that 'We can see, . . . in the modernisation policies advocated by the French government, the desire to reconcile a system of Keynesian-type support given to national economic activity (the stimulation of investment, preferential purchasing, even the creation of integrated networks of production) with a gamble on the innovative abilities of the chiefs of industry (commitments in areas of new products and innovations within the range of older activities)'.[68] It is at this stage that the 'will to modernise' (in Petit's phrase) intersects with the 1980s debate on dirigisme and liberalism in the French state and economy.

Indeed, the consensus over modernisation identified in France and Modernisation echoes the increasing convergence of macroeconomic thinking between Left and Right in France in which the Socialists and the Opposition seem to agree on the advantages of budgetary rigour and of market solutions. In a

recent special number of the Revue française d'Administration publique comparing public sector- and private sector-management, Guy Crespy (director of corporate strategy at CEA-Industrie[69], and a former advisor to the Industry minister) has put forward the view that the investment behaviour of the public and private sector in France has tended to converge since 1985, after considerable divergence in the 1960s (under the influence of Gaullist industrial policy) and again during the early 1980s under the Socialists. Crespy implies that the economic climate plays a rôle in determining the style and scale of state intervention in industry, meaning that in times of relative prosperity the public sector can be expected to exist on the same basis as the private sector, but that in times of recession government investment may be motivated more by political objectives than by economics. Crespy also identifies however, a trend for the state to be less and less able to intervene in industry with massive investment programmes in specific sectors because of the increasing internationalisation of public sector companies

Similarly, Ambroise Laurent (*Conseiller référendaire à la Cour des Comptes*[70]) has considered the need for management evaluation and increased efficiency in the public sector as an indispensable feature of *'la modernisation du service public'*. [71] Laurent identifies the absence of assessment of the management and financing of various examples of *'service public'* as being a major handicap to the efficiency and accountability of their activities. Considering the *Commissariat à l'énergie atomique* (CEA), the *Groupement industriel des armements terrestres* (GIAT) and *la Poste*, Laurent states the general principle that when monopoly positions are threatened by new technology or by European integration, or when their funding becomes too onerous, state organisations are progressively given greater and greater management autonomy in the hope that new (non-governmental) sources of finance will be forthcoming. The case of the GIAT ordnance factory ('arsenal') which was transformed into a *société nationale* in June 1990 illustrates the occasional necessity for a change of statutes when state establishments can no longer be maintained within their traditional rôles by the application of more efficient management techniques.[72]

For some analysts, such as Ezra Suleiman, the natural corollary of state disengagement in France is a need for more regulation of increasingly private industry.[73]

Turning from the wider context of industrial policy which provides part of the wider context in which French space policy is made, in the next section we shall narrow the focus of this review of literature to see what light studies of French

science policy have thrown on the development of the French space effort and on the making of space policy.

2.4. The Organisation of French Science and Technology.

Studies dealing exclusively with science policy and the organisation of science and technology in France are, as has been remarked, relatively scarce. We shall look at the main contributions to the analysis of French approaches towards science and technology in general, and where appropriate, evaluate their treatment of space activities in the light of our concerns.

2.4.1. The 1960s - *'pour une politique scientifique'*

The 1960s were a period of growing interest in science policy studies as it became increasingly evident that science and technology were of prime importance in the achievement of industrial and military influence. The mid-1960s saw the publication of three important works on French science. These were: Pierre Piganiol and Louis Villecourt, Pour une politique scientifique, (1963)[74]; OECD, Review of National science policy - France, (1966)[75]; and Robert Gilpin, France in the Age of the Scientific state, (1968). Piganiol and Villecourt's call for a concerted attempt to implement a rational strategy for the advancement of science and technology was one of the earliest such appeals, and the studies by the OECD and Gilpin have become almost indispensable source books for analysts of more contemporary science policy problems.

Pour une politique scientifique looks at three issues. Firstly it looks at scientific progress in terms of its nature and repercussions and its political, economic and social importance in a *'grand état moderne'*. Secondly, it describes the development, organisation and structure of French science and looks at the policy for its encouragement. Thirdly, it investigates what lessons may be drawn from other countries.

The collaboration between Piganiol and Villecourt was brought about in December 1958 by the reorganisation of science and technology structures prepared in part under the Fourth Republic and implemented under de Gaulle; their views can therefore be attributed a quasi-official status. The preface to their work, contributed by the Nobel laureate André Cournand, warns the reader not to expect a dogmatic presentation, since science policy, like economic policy, develops as a result of the two opposing influences of *'planification et*

libéralisme'.[76] They go on to conclude that *'Face à la Recherche, dans l'immédiat, la politique est le grand interlocuteur.'*[77].

Pour une politique scientifique's treatment of the space sector is necessarily brief since CNES had only been formed a year before the publication of Piganiol and Villecourt's reflections. Space research is dealt with together with nuclear research under the heading of *'Les grandes institutions scientifiques gouvernementales'* since both these sectors enjoyed substantial state funding and depended on central organisations responsible to the Prime Minister. The contrast between the CEA, created in 1945, and space research, whose first coordinating body was set up in 1959, is emphasised. The authors rapidly trace the creation of the *Comité de recherches spatiales,* (January 1959), its four sub-committees, (late 1960), the definition of space research programmes as *'actions concertées'* of priority national interest and their inclusion in the May 1960 Program-Law for Research. They point out that the experience of a single year of the Space Research Committee revealed the inadequacy of its powers and the consequent need for a coordinating body with greater administrative, legal and technical resources, as well as diplomatic expertise to facilitate international cooperation. The body created was CNES, which was created in December 1961 and started activities in March 1962.

'An Original relationship between Science and Society'.

The next important work on the organisation of science in France was the Review of National science policy - France in 1966. In undertaking its survey of French science policy the OECD was hopeful that because France had gone 'further and faster...in the concerted effort to use the power of organised science in the service of economic and social development' any information which could be gathered about France's 'original relationship' between scientific activities and development would lead to a better understanding of the problems facing all OECD member countries. The review traces the influences that eventually led to the 1958 reform of science policy structures and gives a detailed description of the structures created by this reorganisation existing in 1966. The principal elements that should be retained from this section are firstly the parallels between the new science planning structures and those of the economic plan, secondly the concept of a coordinated state science budget, thirdly the mixing of scientists and politicians in bodies such as the CCRST,[78] and finally the division of responsibility between civil science agencies and military research bodies such as the CASD and the DRME.[79] These notions are all of consequence for the subsequent

development of scientific activities in general and for the nature of the space sector.

Our enquiry into the underlying motivations of space policy is concerned with several of the themes brought out in the OECD study. The early 1960s saw moves towards the harmonisation of scientific and political objectives; during this period, within the framework of the Fourth plan (1962-65) 'combined' state-private activities were fostered and, the OECD notes 'As a result of the experimental programmes undertaken as priority activities, wide opportunities were opened up to space research.[80] The extent to which current space programmes harmonise political and military concerns with the dynamic of scientific and technological development is a theme which merits exploration. Similarly, the third stage in the evolution of French science policy identified by the OECD as the encouragement of 'national science programmes for the main economic sectors'[81] reflects the contention that space policy represents an attempt to modernise society.

Science and Modernisation.

Robert Gilpin's France in the Age of the Scientific state continues the themes developed by Piganiol and Villecourt and the institutional analyses of the OECD review but also combines them with more ideological considerations concerning the 'originality' of the French approach to science and society identified by the OECD. For example, Gilpin starts from the assertion made in 1964 by Pierre Cognard that French independence was threatened by the scientific dominance of the USA and concludes that 'The basic issue raised by the statement of this French concern is the future of the nation state in the age of scientific technology'.[82] For Gilpin, the Force de Frappe and the space programme are 'merely the most dramatic and outer manifestations' of France's attempt to become a scientific nation-state.[83] The reorganisation of scientific and para-scientific institutions is likewise an expression of French desire to 'make science an instrument of French economic, military and political objectives'.[84] Indeed, the technology gap and its ideological exploitation and consequences is a matter of primarily political concern, with, one might add, important economic stakes at risk and considerable social consequences. France's position in the world league of technological nations was such that Gilpin identifies two 'dilemmas' complicating her attempt to reduce the technology gap. These dilemmas are firstly the risk of losing traditional French values in copying American patterns of science organisation and secondly losing sovereignty through the European cooperation necessary to challenge US scientific resources.

Gilpin's theoretical perspective on the space and nuclear programmes is that the French believed them capable of 'providing a democratic society with the necessary leverage for reforming scientific, educational, and economic institutions'.[85] Chapter Nine is devoted to a consideration of 'Defence, Space, and Atomic power'. The treatment stresses the military aspects of the nuclear and space programmes, taking its cue from a view expressed in Le Progrès scientifique in March 1966 that 'scientific research contributes in the highest degree'[86] to the defence of a modern country. Commenting on the difficulties of distinguishing between civil and military research, Gilpin presents the 'ambiguity' of the CEA and CNES, remarking that CNES has the dual imperatives of national security and international prestige as its raisons d'être.

According to Gilpin, in developing their space sector 'the French are motivated not merely by disinterested scientific curiosity but by the desire for national prestige and the belief that there is an intimate connection between space research and technological advance in the modern world.'[87] The huge resources required for space research necessitate European cooperation and the concertation of military and civilian programmes. The question of resources and returns is addressed by Gilpin in terms of 'spinoffs' and 'crowding out', against the backdrop of the strategic and prestige imperatives. Although he does state the difficulty of reaching 'definite answers' in the 1960s concerning France's space and nuclear ambitions, Gilpin does arrive at the tentative conclusion that 'the most beneficial aspect of the French military and space programs is their psychological impact. The development of a domestic nuclear striking force and space technology is symbolic of France's commitment to become a modern scientific-technological society.'[88] The risks that France is running in the pursuit of this strategy of modernisation are of course the deflection of resources from civilian research perhaps yielding greater economic benefit and secondly, the threat that such technological nationalism might pose to European science cooperation.

Such, then, are the three main studies of French science and technology published in the 1960s. They are important in that they are the first considerations of the new relationships between science and the state and between military and civil science that were ushered in with the Fifth Republic. They are useful to our enquiry into contemporary space policy to the extent that they set out how the initial space activities were perceived at the time of their implementation. On a general level, these works can be criticised for characteristics which are at the same time virtues. For example, the "closeness" of their analysis to the events they are commenting upon is simultaneously a positive and a negative feature since they have only a relatively limited amount of

data and experience. The approaches are also "dated" in the sense that they reflect the science policy and industrial economic preoccupations of the 1960s. The three studies share the advantageous and disadvantageous feature of treating space as a part of the overall framework of science policy. Space activities are thus situated in their context but do not form the object of any intensive investigation.

Our present study hopes to fill some of the lacunae left by these studies and to develop some of the themes which their analyses suggest.

2.4.2. The 1970s - changing perspectives on science and society

The two major works from the 1970s dealing with French science and technology that we will consider here are; OECD, Changing priorities for government research and development, (1975)[89]; and Pierre Papon, Le Pouvoir et la Science en France (1978).[90] As before, their treatment of the space sector is partial, so mention will also be made of a number of articles bringing complementary information.[91]

Social goals and technological objectives.

The chapter on France in Changing priorities for government R & D notes how science policy was for the first time becoming integrated with economic objectives in the Sixth Plan (1971-75) against a background of centralised decision making for R & D and interministerial discussion of the global research budget in the 1960s. Moreover, as a general phenomenon throughout the member countries in the 1970s government R & D was becoming subject to ceilings rather than target levels of expenditure, with choice between sectors being forced on decision makers.

On the level of science policy analysis, the OECD study deals with a number of concepts useful to our study of space policy. In a discussion of the problems of comparing national priorities for state R & D the distinction is made between 'national goals' and 'objectives'. The OECD definitions are that national goals are 'statements of highly desirable conditions towards which society should be directed.'; and that objectives are 'the stated purpose of an organisation or an individual capable of planning and taking action to gain intended ends'.[92] Examples of national goals are : National security and big science; economic development; community services and the advancement of science. Their formulation is a 'political process involving all elements in our society, especially

the makers of public opinion and the political leadership.'. In the view of the OECD goals are too general to be used as the basis of R & D evaluation. Objectives, however can be so employed since they are combined to achieve the national goals. Thus national security and big science are served by the objectives of defence, civil nuclear and civil space, and economic development is encouraged through the fostering of agriculture, mining, manufacturing and economic services. The notion of 'higher order' psychological-political-popular goals served by 'lower-order' technocratically attainable objectives confirms our background context of the probable role of French space activities in the attainment of symbolic-psychological objectives such as Grandeur.

Towards social and commercial utility.

Robert Gilpin writing in 1975 arrived at an assessment of France's technological strategy during the 1960s that sees the French experience as essentially a failure.[93] He states that 'science policy in France has been first and foremost a product of France's international position'.[94] During the 1960s this position translated itself into attempts to achieve technological and military independence. In attempting to create an American style military industrial complex as Gilpin maintains was the case, the growing weakness of industrial research and technology was neglected, leading to the realisation in the 1970s of the need to encourage industry in the face of competition from West Germany. The failure of France's strategy of independence in technology is explained by Gilpin with reference to a number of factors.

Firstly, the social and monetary upheavals of 1968/69 disrupted France's 'scientific-technological effort'. Secondly, there was 'general disappointment' in the results of government R & D policy - Gilpin gives space as an example: 'The huge investment of funds in space has led to no significant scientific or commercial results; the preponderance of these funds went into the establishment of large ground facilities such as the Guyana base, whose utility has yet to be proven.'.[95] Thirdly, the French were unable to manage the complex processes of technological innovation because of inadequate human skills and capital and lack of management expertise. From these factors, Gilpin derives three prescriptions for 1970s France: managerial and scientific élites must be competent to manage the complexities of centralisation of science and technology policy; projects should not be undertaken merely for reasons of prestige and independence, 'social and commercial utility' should be included as well; and finally, French ambitions in technology should conform more with the country's resources. Thus Gilpin's

updating of his 1968 study draws conclusions similar to those arrived at by Pierre Papon writing a decade after the publication of Gilpin's original work.

Technological and industrial strategies.

In an article published in 1975, Papon put forward his view that French governments' attempts to encourage technological research had been inefficient through lack of a real grasp of the scientific and industrial processes at work.[96] In his study he identified the absence of a 'technological and industrial strategy' and defines the national research strategy as a mere 'pseudo-doctrine'.[97] The point is made that 'scientific policies were largely subordinated to strategic or prestige objectives' and that the Major Programmes underachieved because their development was hindered by lack of a proper industrial policy. Furthermore; 'the technology policy then prevailing was based in part on a simplified view of the mechanics of technological innovation and its dissemination'.[98] In addition to these handicaps, Papon implies that whatever successes the Major Programmes achieved were hindered in their industrial development by the 'anachronistic structures' of French industry and by French inability to cope with the problems inherent in high technology products.

As one of the *Grands Programmes*, Space comes under Papon's scrutiny, but only briefly. He makes the following points: that initially CNES was intended to improve the scientific and technological level of French space activities as well as developing aerospace industrial competitivity; that the scientific achievements of CNES in 1975 were deemed worthwhile although in terms of the overall orientation of the space programme 'excessive ambition' and 'changes of direction' had confused its objectives.

Papon's Le Pouvoir et la Science en France, published in 1978, aims to analyse France's *'système de la recherche scientifique et technique et...ses relations avec les autres institutions sociales et en particulier avec les pouvoirs politiques'*.[99]

It is within the context of this detailed survey that Papon addresses the question of French space activities, along with those of the CEA and the European organisations that CNES and the CEA are linked with by virtue of their international collaboration. The political aspect of space activities is heavily emphasised. For Papon, the political issues at risk have influenced space policy throughout its history: in 1958 the *Comité de recherches spatiales* was created because of *'l'enjeu politique que semblait représenter la recherche spatiale sur le plan international'*[100]; in 1978, politics were still the primary motivation because the industrial implications of space programmes were still seen to be *'d'une*

ampleur limitée'. Against this backdrop of the dominance of political incentives for the development of the space industry, Papon's analysis brings out a number of features such as the external relations responsibilities of CNES (in liaison with the *Quai d'Orsay*) and the material dependence of CNES on the military for launcher rockets until 1967.

The closeness of the links between CNES and other ministries and between space policy and other areas of concern to government is indicative of the perceived nature and importance of the space sector at different stages in the development of the space programme. For example, although initially tied to the Ministry of National Defence and the DGA, CNES acquired autonomy and true civilian status through the *Diamant* launcher programme. The situation is complicated more however by the fact that the Ariane project was strongly supported in its infancy also by the Defence ministry. Papon reiterates his 1975 assertion that CNES has been pulled in too many directions (by forces of attraction within France, not to mention the European dimension) to allow a harmonious overall orientation of policy to evolve. He does identify one particular trend that stands out: *'La politique spatiale est devenue de moins en moins un problème de politique scientifique, elle est de plus en plus un problème politique ayant des implications industrielles et internationales.'*.[101] Moreover; *'le programmme spatial est resté un élément à part de la politique scientifique car ses programmmes n'ont jamais été coordonnés avec ceux des autres organismes de recherche'*.[102] Another feature which sets space policy aside from other areas of government activity is also stressed: the fact that the Elysée considers such matters to belong to its *'domaine réservé'* because of their implications for national prestige.

Papon's final comments on the state's attempts to manage science during the 1960s and 1970s are worthy of inclusion here as a conclusion. He states that *'Les dirigeants de la Ve République ont...presque totalement minoré l'importance des problèmes technologiques et surtout de la nécessité d'un effort continu et de longue durée'*.[103] He concludes: *'La science est restée sans gouvernement et la politique de la recherche, faute d'un grand dessein, est devenue affaire d'administration.'*.[104] This is a somewhat extreme position to take, and indeed might seem paradoxical, given the overall acceptance of the idea that the French state is aware of the importance of science and technology and tries to encourage them. Nevertheless, the expression *'faute d'un grand dessein'* seems to properly imply the existence of uncoordinated isolated goals and strategies.

2.4.3. The 1980s : problems of technology and innovation

In May 1984, Professor Jean-Jacques Salomon of the *Conservatoire National des Arts et Métiers* (CNAM) was invited by the then Minister of Industry and Research Laurent Fabius to draw up a report on the state of French technology policy. During the ministerial changes of the second half of 1984 consequent on the departure of Piere Mauroy from Matignon and his replacement as Prime Minister by Fabius, the report was lost or at least forgotten, until published in 1986 as *Le Gaulois, le Cow-boy et le Samouraï* jointly by the *Ministère du redéploiement industriel et du commerce extérieur* and the new *Ministère de la Recherche et de la technologie.*[105] The report was somewhat shocking and unwelcome because of its iconoclastic assertion that French innovation in technology had actually been decreasing since the 1970s, and that the traditional flagships of French science and technology, the nuclear and space programmes, far from being the comforting presences of the past had become *'le signe même de notre vulnérabilité en matière d'innovation technique'* [106]

Salomon's point in making this accusation was that the technological successes of the past had all essentially been tied to captive markets, but that the future would be based increasingly on the invention and production of high-tech consumer products. His conclusion was that the state was not intervening effectively in the direction of science, technology and innovation policy; *'la contradiction de notre politique de recherche et d'innovation n'est pas tant dans les objectifs que nous nous donnons que dans les modalités d'intervention'.*[107] His recommendations were that it was generally necessary to redefine the divisions between the responsibilities of the state and those of the market in order to weigh against the *'tropisme dirigiste'* [108]. In terms of research and innovation, Salomon identified only three domains where the state could still in his view play the rôles of banker, entrepreneur and client. These were basic research, military R & D and 'heavy' technologies such as space. This tends to give a somewhat contradictory air to Salomon's analysis since he at one and the same time criticises the workings of *grands programmes* as inefficient and wasteful and concludes that some sectors require *grand programmes*, despite these drawbacks. Such an argument underlines the political motives behind high-tech in general and *grands programmes* in particular, and highlights the contradictions to be revealed in our study of the space sector between political motivations and some of the developing economic and industrial characteristics of space activities. Space combines the need for strategic vision beyond the capabilities of the free market and the need for 'commercialisation' which cannot really be provided by the state

agency CNES : *'Ni les grands programmes ni les agences technologiques (par exemple la CEA) ne sont faits pour diffuser des produits ou des processus nouveaux en dehors de leurs secteurs'.*[109]

The next and final section of this Literature review considers various studies specifically focussed on the French space effort published during the 1970s, 1980s and early 1990s. The most recent studies are reports on the content and conduct of space policy called for in the recessionary days of the turn of the decade, when the space programme came to be actively questioned for the first time.

2.5. General analyses of French space activities and 'oversight reports'

We will first look at the literature dealing with the French space effort in a general way. The number of works involved is surprisingly low, only some half-dozen spanning a fifteen year period. Their approach is general in terms of the analysis offered and in terms of the field of space activities under consideration. In effect they deal with the French space sector in the context of European cooperation. The generality of the arguments they develop, whether journalistic, documentary or academic, means that little needs really to be said here by way of commentary, except that many of the themes that they cover are to be looked at more closely in our own analysis.

2.5.1. The 1970s : optimism

Jacques Tassin's Vers l'Europe spatiale, written in 1970, discusses the problems of the European space science and technology organisations founded in the 1960s.[110] It analyses the causes of the difficulties experienced by France in the context of European cooperation. Tassin draws up a number of implicit guidelines for the success of French and European space activities. These guidelines are as follows: *'pour la France, l'Europe spatiale doit se charger de certaines réalisations d'intérêt général, dont la France seule pourrait difficilement assurer le financement'* [111] but that nonetheless, *'la politique spatiale française ne peut être qu'européenne'.* [112] Given this situation, Tassin maintains that the question of European space technology will not be resolved satisfactorily unless it is considered as part of European technology *"tout court".* [113] Starting from the agreed failure of ESRO and ELDO to overcome problems of bureaucratic inertia

and lack of political will, Tassin brings out the themes that make international collaboration in space difficult: the division of the work between states; the huge costs which force cooperation; and the strategic importance of high technology, perhaps the most fundamental cause of government interest in space. As Tassin remarks: *'il s'agit d'utiliser la recherche spatiale comme une des avenues du progrès technologique'.*[114] Moreover; *'L'Espace n'est pas un cas isolé, c'est un échantillon et un catalyseur. C'est le domaine de pointe par excellence.'.*[115] But the crucial importance of space does not go without attendant problems - as Tassin points out - in terms of industrial policy, European space activities took their place amongst the major issues of the period. Budgetary problems led to concern in European countries over the feasibility on grounds of cost of space activities when seen as merely one more example of high technology spending.

2.5.2. The 1980s : the challenge of space

The late 1970s seem marked by an even greater paucity of literature dealing with French space activities on any level, perhaps reflecting a period of consolidation in space policy. However, the appearance in 1982 of a Cahier français devoted to Les Enjeux de l'Espace witnessed an apparent renewal of interest in space matters.[116] Conceived by André Lebeau, professor of space technology and programmes at the *Conservatoire National des Arts et Métiers*, this issue groups together some thirty articles on space related issues.

In *'L'Espace: ouverture pour la recherche scientifique'*,[117] Roger-Maurice Bonnet, Director of research at the CNRS, describes space science as a field that will revolutionise science and technology in general, although four sectors are the most concerned: Astronomy, the study of the Solar system, Earth sciences and biology, and materials science. For Bonnet, space research is an indispensable element of our very culture, in addition to which *'constamment s'affirme le rôle moteur de la recherche scientifique spatiale dans le développement des technologies d'avant-garde'.*[118] The present strength of France's position in world space activities is due in Bonnet's view to the success with which the French have developed satellites for scientific applications, thus acquiring techniques which can be transferred to other fields.

The considerable market that exists for satellite telecommunications and satellite television, (two applications upon which the French are concentrating), is pointed out in Jean-Louis Astor's contribution in which he notes the reasons that lead nations to consider such applications of space technology: *'Les besoins toujours croissants en liaisons de télécommunications conduisent - pour des*

raisons d'efficacité, d'indépendance politique ou d'économie à moyen terme - de plus en plus de pays (ou groupes de pays) à se doter d'un système indépendant de télécommunications par satellite."[119] The Direct Broadcasting by Satellite (DBS) system is similarly presented by Pierre Usunier of *Aérospatiale*'s space and ballistic systems division. [120]

Another article in this section worthy of mention is that which deals with teledetection by satellite. As the editors of the Cahier point out, this is a field where the potential financial rewards are *"gigantesques"* and in which the French are well placed to reap the rewards, given their ambitious Spot Satellite programme. Aline Bats-Chabreuil of CNES, who presents the technology and organisation of Spot and other such satellites describes these activities as marking a new stage in the integration of space technology into the commercial world.[121]

Finally, Alain Dupas presents a brief overview of the military applications of space.[122] Although to the post-SDI observer this treatment may now seem somewhat dated, despite premonitions within the publication of possible US involvement in Star Wars technology, mention of it must be included to do justice to the spread of areas of interest in space already identified in the early 1980s.

The section of the Cahier dealing with the commercial and industrial aspects of space activities considers more specifically the different elements combining to make up French space programmes, industry and policy. Thus Jean-Marie Luton describes French space policy and CNES.[123] Unfortunately, the presentation of the policy is limited to a simple *'historique'* of the development of space activities with a few details of the ministries participating in CNES affairs and the financing of programmes.[124]

We have now presented the most important articles in Les Enjeux de l'Espace. This somewhat lengthy treatment is justified despite the shortcomings of the analyses offered because this collection of views current in or emanating from France does represent the most complete and available coverage of many of the major aspects of French space activities. Published in the early 1980s and thus of direct relevance to our study of recent space policy it differs from Tassin in that it deals specifically with the French experience and integrates some discussion of industrial and commercial issues.

1986 saw the publication in France of two works popularising knowledge of the conquest of space and of the impact of space activities on everyday life. These were L'Espace en héritage by André Lebeau,[125] and Bernard Chabbert's Les fils d'Ariane.[126] Disappointingly, Lebeau's contribution to the overall debate on space policy is relatively small in this work since much of the book is taken up with

a history of rocketry and other such subjects of more technical and historical than policy interest. However, he does isolate two phases in the development of the French space sector over the last twenty five years. During the first phase the role of economic and market forces was negligible, the main motivations for space activities being prestige and the support of international science along with what Lebeau terms *'arrière-pensées militaires*. The second phase was marked by the emergence of the concept of applications and the development of applications programmes. Thus from the mid-1960s it was economic and strategic objectives, along with a concern to foster pure research that motivated the French space effort. In this period, the *arrière-pensées militaires* had evolved into military-strategic concerns with precise aims, typically involving information gathering and telecommunications. Importantly, Lebeau maintains that *'Les considérations de prestige ont à peu près disparu'.*[127] Although he does not go very deeply into the commercial, industrial and socio-economic aspects of space, Lebeau thus isolates the mid-1960s as an important stage in the evolution of the space sector; they marked *'le début d'une phase capitale dans le développement de la technique spatiale...l'assujetissant à la fourniture de services et...amorçant son intégration au système socio-économique'.*[128]

Bernard Chabbert's Les Fils d'Ariane is concerned more specifically with solely French space activities. The book gives an enthusiastic account of the development of the space sector until 1985. Although Chabbert's journalistic style makes for a stimulating read, the approach leaves serious analysis to be desired, notwithstanding several anecdotal details and striking phrases which serve to drive home certain points such as the technology lag between France and the United States.[129] Given the enthusiasm which the author has for the growth of space activities,the most significant elements of his presentation are those in which he implicitly criticises French space efforts.[130] The perhaps unsurprising conclusion that Chabbert derives from this lag in technology is that there is still an important political element to the space effort which at one and the same time prevents Europe from using the most recent technology (under licence from the US) and spurs France on to realise greater technological exploits in the race to catch up.

L'Espace : un défi pour la France

Apart from these general publications on French space activities, one work stands out for the professionalism of the information and the discussion that it contains.

This is the printed proceedings of the ENA conference on space entitled *L'Espace : un défi pour la France* held at the end of 1985.

Published in 1986, Les Actes du colloque: l'Espace, un défi pour la France brings together all the contributions made at the two-day conference, thus forming an almost indispensable source of reference on all matters pertaining to the space sector.[131] Contributions fall into five main sections, following the themes of the debates: the history and assessment of French space activities; strategic and military space applications; civil applications; financial, legal and insurance aspects of the space industry; and France and the European space effort.[132]

The individual articles and contributions made during the debates of the conference by these and other participants would be of sufficient interest to merit detailed comment and analysis. However, their somewhat detailed nature means that it is difficult to synthesise a global appreciation of the conclusions of the conference, and therefore reference will be made to the opinions and data expressed by participants at the *colloque* at appropriate stages in our own analysis. The overall message of the conference was that space was indeed a challenge for French industry, technology and finance, as well as an area of expertise in which considerations of national defence were increasingly relevant. For Hubert Curien, the then minister for Research and Technology responsible for the *tutelle* of CNES, speaking in the closing round table discussion of the conference, the situation was resumed by a statement which stressed the practical aspects of space in the 1980s and underplayed the symbolic and psychological aspects of such a motivational high-tech sector.[133] It is the weighting of this combination of factors - the military, the civil (and the economic) and the symbolic - that we will elucidate in our investigation of the making of French space policy during the 1980s.

Cohendet and Lebeau's 1987 study of the nature of major French state intervention in civil technology, Choix stratégiques et grands programmes civils examines the rationale of such methods of government action and gives a brief investigation of the example of space as a *grand programme*-strategy.[134] *Grand programmes* are described as *'un mode original d'aide publique à l'innovation industrielle et à la recherche',*[135]and the authors point out that the *grand programme* is peculiar in that it tends to have greater indirect effects on society than other equal volumes of state capital investment. These indirect benefits are technological, organisational, commercial and managerial/social,[136] especially in the case of space since the special nature of space activities creates a large variety of spin-offs and interactions : *'les projets spatiaux se présentent...comme un carrefour technologique qui exige la synthèse de technologies avancées des*

secteurs les plus divers'.[137] Cohendet and Lebeau stress the close links between government and *grands programmes* and between the action of *grands programmes* and the state. In terms of power and control, they state clearly that *'le contrôle d'un grand programme dont la création est un acte politique, doit demeurer une affaire de gouvernement'.*[138] In terms of the rôle and image of the state, the authors point out that the *grand programme* has a symbolic effect as well as a practical one. Indeed, the notion of the *grand programme* has an influence on the *'conscience collective que la France ou l'Europe ont de leur capacité et de leur identité'.*[139] More specifically again; *'les grands programmes ont contribué pour une part à combattre le syndrome du déclin et de la défaite inéluctable'.*[140]

In their discussion of the case of the space programme as an example of a typical *grand programme,* Cohendet and Lebeau focus particularly on the relevance of the *grand programme* approach to contemporary industrial and commercial conditions, despite the fact that *grands programmes* are not suited to new and rapidly evolving market conditions, it would seem that for these two analysts space does indeed remain an appropriate domain for the *grand programme* approach because of its importance in national defence, and because of its capacity to generate new techniques of value to society but whose cost and time-scales for development are too great for the market to bear.[141]

Although all the studies presented above have the merit of dealing with space as the prime concern of their analysis, they still have the disadvantage of examining only the most superficial aspects of the French space effort. The neglect to which they subject the more institutional and theoretical aspects of space policy in terms of science and industry policy as well as defence is to be redressed to some extent by this thesis.

2.5.3. The 1990s : 'oversight reports'

During the late 1980s and early 1990s attention came to be focussed on 'assessing' the efficiency and effectiveness of government policy. This general movement towards some kind of *'évaluation'* of public policy initiatives included science and technology policy and the space sector itself, which, as well as being subjected to increased scrutiny from the newly created *Délégation générale à l'Espace* in 1989, also became (for the first time) the object of investigations by various scientific, governmental and parliamentary bodies. The two most important analyses of the French space effort were provided in the major studies by the *Office parlementaire d'évaluation des choix scientifiques et technologiques*

(December 1991)and by the *Comité national d'évaluation de la recherche.* (September 1992).[142]

L'Office parlementaire d'évaluation des choix scientifiques et technologiques (OPECST)

The OPECST was set up in 1985 by the French parliament (National Assembly and Senate in collaboration) in order to provide deputies and senators with the possibility of objective information on scientific and technical questions.[143] The OPECST investigation of French and European space policy was requested by the Senate Finance committee in October 1989 and led to the eventual publication of the Report in December 1991 under the title Rapport sur les Orientations de la politique spatiale française et européenne.[144]

The Report was one of the longest and most detailed undertaken at that stage by the Office and involved exhaustive investigations and interviews with all those responsible for the definition and management of the French space effort, both civil and military. As the rapporteur, Senator Paul Loridant, emphasised in his introduction to the Report, the initiation of an inquiry into the conduct of French space activities was very much 'a first', and perhaps because of the newness of the concept of criticising CNES and the national space effort, the report is sometimes somewhat basic and descriptive in its approach (one of its intended uses is of course as a source of basic information for unscientifically-minded parliamentarians). The report's approach is evidently a sceptical one, although it is coloured heavily by the repeated recognition by the rapporteur of the political, strategic and prestige justifications for the maintenance of a strong French space programme. The essential thrust of the report is that a balance must be found between prestige, commercial and 'public service' (scientific development, satellite broadcasting and observation etc) justifications for space activities. According to the report, such a balance between the different motivations of the space effort necessitates a more public discussion of the objectives and means of space policy, and specifically, parliamentary debate on the space effort and the definition of a Space Programme law (*'loi de programmation spatiale'*) which would set out policy and funding in an explicit pluri-annual framework. The report is generally positive about the past successes of the French space sector and of the French-led European industry, seeing the European space industry as 'respectable' in financial, technological and industrial terms when compared with the US, but emphasises that consolidation and greater efficiency in the definition and conduct of programmes are required to maintain European space expertise. Despite the

fact that the *Office* rejects the argument in favour of space that it is a motor of technological development (*'une locomotive technologique'*), the report still states that space deserves its priority status because of the combination of geostrategic, economic, public service and technological advantages that it confers on France. In addition to general recommendations that the space effort needs to be rationalised organisationally and financially, the report raised specific doubts over the justification for the manned *Hermès* space shuttle/plane and its associated *Ariane V* heavy launcher and *Colombus* laboratory module. By stressing that the motivations for manned European space flight are exclusively political and prestige-based, the report contributed to the consolidation of cost-based criticisms of Hermès which eventually led to its (indefinite) postponement in November 1992.[145]

Le Comité national d'évaluation de la recherche (CNER)

The CNER was set up by decree in 1989 as a result of the dispositions in favour of the definition of strategic options in national science and technology policy and for the assessment (*'évaluation'*) of that policy contained in the 1985 Law on Research and technological development.[146] The study undertaken by the CNER of the space programme was one of the first, the early interest of the *Comité* in the space sector resulting from the size and prestige of the space programme, from the rate of growth of spending on space, and most generally, because *'le programme spatial est devenu un élément essentiel de la politique scientifique et technologique nationale'*.[147] The final document was made public in September 1992 under the title Rapport sur le Programme spatial français.

If not damningly critical in its assessment of the space programme, the report is nevertheless somewhat sceptical about the efficiency with which CNES has been running the French space sector - despite an overall good impression, the CNER found that CNES's activities were blighted by problems of organisation, funding and project management.[148] Before we consider the main findings and recommendations of the *Comité*, it is interesting to note that the report indulges in some sardonic comments on the difficulties of obtaining reliable figures, or even documentation of decisions from CNES, and complains that it is not often evident where responsibilities lie within CNES and between the various administrative bodies which make up the space sector.[149]

The report presents seventeen conclusions and recommendations. Concerning the definition and management of the space programme it notes that whilst steps have been taken to normalise the channels for the financing of CNES,

further overall increases in funding for space will be impossible without prejudicing other fields of research. To help the organisation of funding, the *Comité* suggests that the space programme should be set out in the form of a long-term plan, that CNES should institute proper accounting practices, that project cost evaluation should be made more accurate, and that CNES should avoid funding activities which have reached operational (commercial) status. Concerning the decision-making structures of the space programme, the report criticises the lack of clarity in the patterns of responsibility in the space sector, questions the involvement of CNES in operational and industrial aspects of space programmes, recommends that the agency should review its policy of creating subsidiary companies and suggests that CNES could expand its responsibilities to encompass military space programmes. Concerning the broad thrust of space policy, the report gives qualified approval to CNES's scientific programme, and to the Ariane V heavy launcher programme, but condemns Hermès as technically and financially impossible within the terms of its original specifications.

2.6. Conclusion

We have now looked at the main fields of comment and analysis dealing with the activities of the French space sector and the context within which French space policy is made and operates. It can be seen that space has a complex nature requiring pluridisciplinary study. The approaches reviewed are partial in their treatment of space activities, although offering useful insights into the way the space sector and space policy should be analysed as a unique object of study. The way in which we propose to give an overall study of the determinants of French space policy by combining analysis of the Military and Civil sectors and their relationship to governmental authority and the State has been set out in the Introduction, but having now outlined the previous studies of space in France we can set out in more detail how this present treatment aims to progress beyond the works described above.

The decision to omit detailed consideration of the straightforward international diplomacy aspects of the French space effort has already been justified through the way in which it provides an uncontroversial background to the domestic developments in space policy. Almost without exception, the works presented above look at the French space effort (indeed, when space is their primary concern) in the narrow perspectives of either defence policy, diplomacy, or

science policy. This thesis looks at the making of overall space policy in a wider socio-political-administrative context.

The analysis of the determinants of and making of French space policy developed in the following chapters reveals how the French space effort is made up of a complex interaction of interests, agencies, ambitions and inertias. By concentrating on the ways in which inputs to the overall space effort develop separately in the civil and military fields and then coalesce into a combined programme, the study emphasises the disparity of sources for policy making and reveals the important rôles played by the armed forces bodies involved in the spatial modernisation of French defence, and by CNES as an interface between the space sector and government.

Having established what sources of information and analysis pre-exist the thesis, it is necessary, before looking in detail at the different strands of space policy since 1979 to synthesise the practical background against which space policy was made in the last ten years. Thus the following chapter presents the historical background to the French space effort in the 1980s and 1990s by looking at the origins and development of civil and military space in the 1950s, 1960s and 1970s.

Notes to Literature Review

1 For example the SDI declaration, the Challenger Shuttle disaster, Ariane launch failures or moves towards disarmament.

2 M. Edelman, The Symbolic uses of politics. (University of Illinois Press, Urbana, 1964).

3 Ibid., p.2.

4 Ibid., p.20.

5 Ibid., p.56.

6 E. A. Kolodziej French International policy under de Gaulle and Pompidou: the politics of Grandeur. Cornell U.P., 1974.

7 Cambridge University Press, Cambridge, 1980.

8 UNCP, Chapelhill NC,1981.

9 Kolodziej, Op. cit., p.10.

10 Ibid., p.10.

11 Ibid., p.10.

12 Ibid., p.11.

13 R. Gilpin, France in the Age of the Scientific State. Princeton U.P., Princeton, 1968.

14 Kolodziej, Op. cit., p.97.

15 Martin, Op. cit., p.13.

16 Ibid., p.323.

17 Ibid., p.22.

18 Ibid., p.85.

19 Cerny, Op. cit., p.88.

20 Ibid., p.99.

21 Ibid., p.110.

22 Ibid., p.112.

23 Ibid., p.121.

24 Ibid., p.198.

25 Ibid., p.200.

26 Ibid., (sic), p.200.

27 Princeton U.P., Princeton, 1987.

28 Kolodziej, Op. cit., p.303.

29 Ibid., p.69.

30 Ibid., p.69.

31 Ibid., Introduction, p.xv.

32 Ibid., p.4.

33 Dyson, Kenneth, The State tradition in Western Europe. Martin Robeson, Oxford, 1980, p.166. In The State Tradition, Dyson characterises the French state as possessing a 'heritage of ideas of Roman law' and 'an historical experience of the leading role of the public bureaucracy', features held in common with Germany. The French state is also intimately linked with the idea of the nation, (more so than the German), and the French state is held to be the servant of the nation. This 'capacity for action in the service of ethical values' and the idea of the state having 'purposes' stress the fact - of importance as background for our study - that in France government action is not just managment of the status quo, but progress towards objectives such as modernisation and national autonomy

34 See Stanley Hoffman (1963) and Michel Crozier, La société bloquée. (1970).

35 Dyson, Op. cit., p.224.

36 Ibid., p.224.

37 L. Rolland, Précis de Droit administratif. Dalloz, 1938.

38 There are other forms of provision such as nationalised companies, *Etablissements publics à caractère industriel et commercial* and *groupements d'intérêt économique.*

39 Dyson, Op. cit., p.126.

40 Such as The Political Economy of communications. International and European Dimensions. Routledge, 1990, and, especially, The Politics of the Communications Revolution in Western Europe, Frank Cass and Co., 1986.

41 Dyson, K., West European States and the Communications Revolution', p.10, in Dyson and Humphreys (eds), The Politics of the Communications Revolution in Western Europe. Frank Cass and Co., 1986, pp.10-55.

42 Ibid., p.47.

43 Ibid., p.47.

44 Mc Dougall, Walter A., Technocracy and Statecraft in the Space Age - Toward the History of a Saltation. American Historical Review, Vol 87, October 1982, pp.1010-1040.

45 Ibid., p.1011.

46 Ibid., p.1011.

47 Ibid., p.1030

48 Ibid., p.1033

49 The original quote from de Gaulle is *'sans que la France cesse d'être la France'.*

50 McDougall, Walter A., Op.cit., p.1034.

51 Ibid., pp.1036-37

52 Ibid., p.1040.

53 W. Rand Smith, We can make the Ariane, but we can't make washing machines : the state and industrial performance in post-war France. Contemporary France Vol. 3, eds: Howorth, J and Ross, G., Pinter Publishers, 1989, pp175-202;
Green, D., The political economy of information technology in France. France and Modernisation. Ed. Gaffney, J., Avebury, 1988, pp.124-137;
Gourevitch, P., Making choices in France: industrial structure and the politics of economic policy. France and the troubled world economy. Eds Cohen, S., and Gourevitch, P., Butterworth Scientific, 1982, pp.1-20;
Cohen, S., and Gourevitch, P., Informed bewilderment: French economic strategy and the crisis in France and the troubled world economy. Butterworth Scientific, 1982, pp. 21-48;
Hayward, J., The State and the Market Economy. industrial patriotism and economic intervention in France. Harvester Press, 1986.

54 Rand Smith, Op. cit., pp.183-184.

55 Green, Op. cit., p.133.

56 Making choices in France, pp.14-15.

57 It is interesting to note, (as Le Monde puts it), that the appointments of chairmen have seemingly privileged managerial competence and respect for the bottom line - *PDG en l'état: Dans le renouvellementdes patrons des entreprises nationalisées, le pouvoir a choisi la logique économique*, Michel Noblecourt, Le Monde, 3 July 1992.

58 Cohen, Elie, Le Colbertisme "high-tech", Économie des Telecom et du Grand projet. Hachette Pluriel, Collection enquête, 1992.
De Boissière, J-B, and Warusfel, B, La Nouvelle frontière de la technologie européenne. préface de Raymond Barre, Calmann-Lévy, Essais société, 1991.

59 This is the fourth of Elie Cohen's analyses of French industry and industrial policy; it continues the work of Qui gouverne les grands groupes industriels (1981 with Michel Bauer), Les grandes maneouvres industrielles (1985 with Michel Bauer) and L'Etat brancardier (1989).

60 *'Le principal de ces risques est que la réalisation du marché intérieur à l'horizon 1992 accentue la perméabilité et donc la vulnérabilité stratégique de l'Europe. Cette affirmation constitue l'exact contre-pied de la thèse selon laquelle la Communauté est en train de se transformer en forteresse. Mais l'idée de forteresse n'a pas de sens s'agissant de la technologie. Dans bien des domaines, l'industrie européenne continue à dépendre du "know-how" américain, tandis que sa dépendance vis-à-vis des composants japonais devient alarmante. Le recul de l'interventionnisme des Etats va - de plus - faciliter la pénétration des marchés nationaux par les firmes non-européennes. La forteresse technologique est donc un mythe'.* De Boissière and Warusfel, Op. cit., p.334.

61 They draw particularly on his Indépendance de l'économie nationale et interdépendance des nations. Aubier-Montaigne, 1969.

62 *Nous avons oublié en chemin la politique industrielle, comme M. Jourdain oubliait qu'il parlait en prose, tellement celle-ci va de soi : nos stupides querelles d'avant-hier nous ont fait oublier l'essentiel*

d'aujourd'hui, c'est-à-dire que les chefs d'entreprise n'étaient pas tous infaillibles, que les fonctionnaires n'étaient pas tous stupides et qu'il fallait une puissante lanterne pour éclairer les voies mystérieuses et changeantes du marché. Dans sa modestie apparente, ce rôle d'éclaireur est l'un des devoirs fondamentaux de l'Etat moderne. The quote itself is from Le Monde, 26 November 1988, Roger Fauroux, Industrie: Les clés du succès. De Boissière and Warusfel, Op. cit., p.284.

63 *Se faisant le bouclier du capitalisme autochtone, l'Etat français produit une réponse adaptée au nouveau cours libéral puisqu'il laisse les groupes industriel publics ou privés maîtres de leur stratégie, plaide leur cause au niveau communautaire et les protège ultimement au niveau du capital'.* Cohen, Op. cit., p.383.

64 Crozier, Michel, Etat modeste, Etat moderne. Stratégies pour un autre changement. Fayard, 1987

65 Ibid., p.6

66 Op. cit., p.6. My emphasis.

67 The Economy and Modernisation: An Overview, Chapter 3, pp.44-65 in Gaffney, J., (ed.), France and Modernisation. Avebury, 1988.

68 Ibid., p.57.

69 An industrial subsidiary of the *Commissariat à l'énergie atomique.*

70 The *Cour des Comptes* is the nearest French equivalent to the American General Accounting Office and the British National Audit Office. In June 1992, the head of the *Cour*, (Pierre Arpaillange), expressed dissatisfaction with the little attention paid to the *Cour's* annual Rapport au Président de la République and suggested that closer links with the Senate and National Assembly, where the Cour's recommendations could be discussed would increase its effectiveness. Le Monde, 25 juin 1992, 'Un entretien avec le premier président de la Cour des comptes'.

71 Laurent, Ambroise, Le contrôle de gestion dans l'entreprise et dans l'administration. Revue française d'administration publique, No. 59, juillet-septembre 1991, pp.427-434.

72 In the National Assembly debate which considered the transformation of the GIAT into a *société nationale*, Defence minister J-P Chevènement and the *Commission de la Défense nationale* argued that the new status of the GIAT would make it more dynamic, flexible and efficient. Violently opposed by the Communists, who saw the change in statutes as a 'hidden privatisation', the bill was passed by 279 votes to 240. See Pierre Servent, Le Monde, 10-11 décembre 1989, 'Le groupement industriel des armements terrestres va changer de statut'.

73 'En France, avec les privatisations, et au fur et mesure que l'Etat se désengage des industries et des institutions financières, un besoin accru de régulation se fait sentir.' Suleiman, Ezra, 'L'Etat a-t-il un avenir dans une société qui se méfie de lui. Revue française d'administration publique, no. 61, janvier-mars 1992, pp.135-138.

74 (*Flammarion*, Paris, 1963).

75 (OECD, Paris, 1966).

76 Piganiol and Villecourt, p.6.

77 Ibid., p.14.

78 *Comité consultatif de la recherche scientifique et technique.*

79 *Comité d'action scientifique pour la défense, Direction de la recherche et des moyens d'essais.*

80 OECD, Op. cit., p.44.

81 Ibid., p.44.

82 Gilpin, Op. cit., p.4.

83 Ibid., p.7.

84 Ibid., p.7.

85 Ibid., p148.

86 Quoted in France in the Age of the Scientific State, p.253.

87 Gilpin, Op. cit., p.274.

88 Ibid., p.300.

89 (OECD, Paris, 1975).

90 (*Editions du Centurion*, Paris, 1978).

91 (LGDJ, Paris,1972).

92 Changing Goals for Government Research and Development, p77.

93 Gilpin, R., Science, technology and French Independence. in T. Dixon Long and Wright, C., (eds), Science Policies of Industrial nations, Praeger, N.Y., 1975, pp.110-132.

94 Ibid., p.131.
95 Ibid., p.125.
96 Papon, P., The State and technological competition in France, or Colbertism in the 20th Century. Research Policy (1975-4), pp.214-244.
97 Ibid., p.219.
98 Ibid., p.237.
99 Papon, Op. cit., p.9.
100 Ibid., p.127.
101 Ibid., p.132.
102 Ibid., p.133.
103 Ibid., p.277.
104 Ibid., p.277.
105 Salomon, J-J., Le Gaulois, le Cow-boy et le Samouraï, CPE/Economica, 1986.
106 Ibid., p.11.
107 Ibid., p.100.
108 Ibid., p.189.
109 Ibid., p.191.
110 Tassin, J., Vers l'Europe spatiale, Denoël, 1970.
111 Ibid., p.168.
112 Ibid., p.172.
113 Ibid., p.192.
114 Ibid., p.135.
115 Ibid., p.11.
116 Les Enjeux de l'Espace, La Documentation française, 1982.
117 Bonnet, R.M., L'Espace, ouverture pour la recherche scientifique, pp.30-36.
118 Bonnet, Op. cit., p.36.
119 Ibid., p.47.
120 Franco-German collaboration on DBS since April 1980 has led to the development of a capacity parallel to the cable networking of French cities. It might also seem that satellite telecommunication duplicates existing submarine cable facilities. This apparent 'belt and braces' approach is explained by Jean Grenier by the fact that these two methods of transmission are considered to be more complementary than competitive. This itself is because of France's geostrategic position in the world: *'D'une manière générale, la situation géographique de notre pays, bordé par l'océan Atlantique et par la Méditerranée, ainsi que la structure de son trafic font que la répartition de ses circuits intercontinentaux entre câbles sous-marins et satellites s'est maintenue dans la proportion de 60% et 40% au cours de ces dernières années'*. Grenier, J., Satellites et câbles sous-marins: rivalité ou partage ?, pp.54-55.
121 Bats-Chabreuil, A., Connaître et gérer la Terre, pp.56-66.
122 Dupas, A., L'Utilisation militaire de l'espace. pp.81-88.
123 Luton, J-M., La Politique spatiale française, pp89-95. And *'Le CNES'*, pp.96-98.
124 Luton shows how, institutionally, the links between telecommmunications and space for example are reflected in the roles played by the PTT ministry, TDF and the *Direction Générale des Télécommunications* (DGT), who have thus contributed to the rise of the space industry. A presentation of the role of the DGT is followed by an overview of the space industry by the head of the industrial policy division of CNES, Alain Simon. Simon stresses the importance of space as an industry and shows the nature of the industry in terms of government and private company contract responsibilities: as an indication of the range of commercial and industrial interests in space apart from telecommunications we can cite the examples of micro-gravity processing techniques of materials and pharmaceutical products. A brief discussion of the European dimension is included. Simon, A., L'Industrie spatiale française, pp.102-107.
125 Lebeau, A., L'Espace en héritage. Editions Odile Jacob, 1986.
126 Chabbert, B., Les fils d'Ariane,
127 Ibid., p.48.
128 Ibid., p.113.

129 In Les fils d'Ariane, for example the enormous differences in funding between the early Ariane programme and the contemporary military space programmes, (p.117), and the expression *'le stop orbital'* ("orbital hitch-hiking") to describe France's attitude towards collaboration with the superpowers for space flights.

130 For example, he points out that the HM60 rocket engines being developed by SEP and ONERA for the new Ariane V are a technological generation behind the American shuttle engines which have been in service since 1977. Studies on the HM60 were begun only in 1983, 23 years after the equivalent Saturn J2 engine was decided on in the US.

131 L'Espace: un Défi pour la France. Association des anciens élèves de l'ENA, 1986.

132 Those present at the colloque included academics such as André Lebeau and Claude Carlier, scientists having acted as advisors to politicians on technology policy such as Pierre Aigrain, politicians and diplomats such as Dominique Baudis, Hubert Curien and Claude Arnaud and finally high-ranking officers from the Army and Navy such as General Fricaud-Chagnaud, Admiral Jean Chabaud and military technical experts (*Ingénieurs général de l'armement* Jean Sandeau, Jean-Yves Leloup and Daniel Pichoud). Also contributing were experts from the commercial and financial sectors of the space industry: Frédéric d'Allest (PDG *Arianespace*), Jacques Imbert (PDG *Alcatel-Thomson-Espace*), Jean-Luc Lagardère (PDG *Matra*) and Roger Lesgards (PDG SEP) from industry itself and financial and insurance experts such as Philippe Sahut d'Yzarn, Patrick Peugeot and Robert Stakowski.

133 *'cette table ronde regroupe un ministre, des hauts-fonctionnaires, des banquiers et des industriels. Si on avait organisé un tel colloque il y a vingt ans, on n'aurait certainement pas eu d'industriels ni de banquiers à la table....On est passé de l'Espace prestige à l'Espace technologique, et maintenant à l'Espace économique dans les pays les plus avancés.'* L'Espace: un Défi pour la France, p.348.

134 Cohendet, P. and Lebeau, A., Choix stratégiques et grands programmes civils, CPE/Economica, 1987.

135 Ibid., p.84.

136 Ibid., p.90.

137 Ibid., p.121.

138 Ibid., p.129, Interestingly, this viewpoint seems to conflict somewhat with that expressed in the late-1970s by Papon, to the effect that Science policy had, unfortunately, become *'une affaire d'administration'*. (A possible explanation for this contradiction is that Papon was essentially referring to scientific research, whilst Cohendet and Lebeau's main focus of attention is the mainly technological *grand programme*).

139 Ibid., p.181.

140 Ibid., p.181.

141 Ibid., pp.68-70.

142 The first such study was undertaken by the *Comité des recherches spatiales* of the *Académie des Sciences*, whose Rapport sur la recherche et la politique spatiale dans les prochaines décennies was completed in March 1988. Another study of space policy was provided in the Rapport annuel 1991 du Conseil supérieur de la recherche et de la technologie (CSRT).

143 In many ways the OPECST is intended to be a French version of the American Office of Technology Assessment, although several differences distinguish it from the US model. For example, the OPECST does not have in-house technical experts, but relies on co-opted specialists for each report they undertake. The *Office* works on the principal of 'saisine' by parliamentarians, in which deputies or senators, or the bureaux of the Assemblies, or parliamentary committees request the *Office* to investigate an issue involving science and technology and to present a report detailing the Office's findings and recommendations.

144 The actual investigations were made during the period October 1990 - October 1991.

145 The Grenada ESA summit postponed/cancelled Hermès on the grounds of its escalating costs, and because the financial burdens of reunification were making the Germans reticent to subsidise what they saw as an essentially French prestige project.

146 Décret 89-294 du 9 mai 1989 relatif au Comité national d'évaluation de la recherche, (Journal Officiel, 11 mai 1989, pp. 5952-5953), and Loi 85-1376 du 23 décembre 1985 relative à la recherche et au développement technologique. The *Comité* is an independent body which recruits its experts itself for each evaluation of scientific programme or institution that it undertakes, and then submits the conclusions of its study to the minister responsible for Research. In addition to the individual reports relating to the evaluations, the *Comité* presents an annual public report to the President of the Republic which summarises the activities of the *Comité* and the findings of its investigations.

147 CNER, Evaluation du programme spatial français, avis et recommendations. CNER, September 1992, p.3. The two year study resulted in the preparation of a confidential *'rapport de synthèse'* presented to the *Ministère de la Recherche et de l'Espace* or MRE, (CNES' controlling ministry) and to CNES itself; this report was then modified in the light of comments made by the two institutions and as a result of discussions between CNER, CNES and the MRE.

148 Ibid., p.5.

149 For example the report states that its experts were unable to find any written evidence internal to CNES of the French decision to undertake the Hermès programme in December 1985, (p.9), and criticises at several junctures the absence of a proper accounting system within the space agency.

3. History of the Space Effort 1945-1979

The total period spanned by the French space effort stretches from the immediate post-war years to the most recent changes induced by the Geneva disarmament negotiations, the end of the Cold War, the Gulf War, economic recession, and the continued move towards European Union. Since our study is essentially concerned with the period from 1979 to 1992, throughout which we are to trace the relationships between the different component elements of, inputs to and influences on the making of space policy, the Mitterrand years will be considered in detail in the subsequent sections. However, the making of civil and military space policy in the 1980s and early 1990s cannot be entirely divorced from the formative events of the post-war period, particularly the 1960s and 1970s, and this justifies the brief chronology presented here of the French space effort from 1945 to 1979.

In terms of the military inputs to the evolution of the space effort, it is helpful to divide this long span of time into some half-dozen sub-periods corresponding for the most part to the duration of the Military Law programmes. Thus 1946-1959 represents the phase of technological preparation for the atomic and missile programmes, 1960-64; the first *'loi de programme'*, 1965-70 the second *'loi de programme'*, 1971-75 the third '*loi de programmme*' and 1976-1979 the early Giscard/Barre years.[1]

Alongside the development of the military aspects of space strategy, organisation and industry, the civil inputs to the definition of policy and the elaboration of the space programme also evolved during this period with changing attitudes towards science and technology, resulting most notably in the creation of the civil national space agency, the *Centre national d'études spatiales* (CNES) in 1961, and in 1979, the first launch of the French-led European satellite launcher Ariane.

The plan of the chapter is thus the following :

- **3.1.** 1946-1959 : The Initial effort
- **3.2.** The 1960s : CNES, the *Force de frappe* and *'tous azimuts'*
- **3.3.** The 1970s : Civil and military space in the 1970s - consolidation
- **3.4.** Conclusion

3.1. 1946-1959 : the initial effort.

In the field of 'Big science', in France, 1945 saw the creation of the *Commissariat à l'Energie atomique* (CEA) or Atomic Energy Commission, and 1946 the Parodi declaration before the United Nations in which France claimed that the French atomic research effort was purely civil in motivation. Despite this claim, the work of the CEA directorate entrusted with military applications produced the first French atomic explosion at Reggane in the Sahara in 1960. In parallel with the early development of this atomic expertise, placed ambiguously (in government rhetoric at least) between civil and military applications, the birth of the French space industry was purely military. In 1946 the *Laboratoire de Recherches balistiques et aérodynamiques* (LRBA) at Vernon was created to work on the study and production of ballistic missiles and rocket launchers, profiting from captured German V2 missile technology, and under the aegis of the *Direction des études et fabrication d'armement* (DEFA) of the Ministry of Defence, the LRBA carried out the armed forces' ballistic missile research programme, which was assigned the objective of developing the liquid-fuelled *Véronique* rocket.

3.1.1. The 1950s : the choice of vector for the French deterrent

During the 1950s, the French space effort was essentially concerned with the development of launchers to complement the planned atomic warheads being secretly prepared by the CEA. The *Véronique* programme, initially a military project, eventually provided a civil launcher for French participation in the International Geophysical Year of 1959. One of the major issues of this period was the choice between liquid- and solid-fuel technologies for the missile propulsion systems, and the choice made in favour of solid powder engines over liquid propulsion stimulated a developing split between military and civil work. The waning of military interest in liquid-fuelled missile technology that occurred in the mid-1950s, which effectively led to *Véronique* becoming a civil rocket, was a consequence of both strategic and technical factors. Firstly, there was a certain amount of confusion as to whether the yet to be produced atomic warheads would be transported by missiles or by long-range strategic bombers: 1956 saw two contradictory declarations on this subject coming from different actors in the military bureaucratic hierarchy, the Secretary of State for Air stating that bombers would be cheaper and more reliable, and the *Chef d'Etat Major* deciding to procede with both bomber and missile vectors.[2] Secondly, on a strategic-

technical level, *Véronique* seemed unlikely to be the most efficient choice of vector because its liquid propellant made the launch phase time-consuming and inappropriate for rapid response to aggression. The affectation of the *Véronique* rocket to civilian service also underlined the possibility of exchanges between civil and military functions in the field of space technology.

Continued military interest in launchers was guaranteed by the political decision to develop both Air Force and Army vectors for the Deterrent force (thus reducing inter-service rivalry by using both planes and missiles), confirmed by *Délégué Ministériel pour l'armement* General Fourquet in May 1957,[3] and the choice of solid-fuelled rocket motors for the army missiles was confirmed by a 1958 inquiry headed by Inspecteur-Général Girardin. Thus the 1950s showed that France was capable of developing a range of space technologies required for ballistic missile production, and that exchanges between civil and military aspects of the 'space sector' were possible and fruitful.

1959 was a crucial year for the French space effort because it was marked by an overt political declaration of France's will to become a nuclear power and by the beginnings of actual missile production. The initial period of the 1950s, dominated by military research into missile and space technology concluded with General de Gaulle's November 1959 speech before the *Ecole Militaire* in which he stated France's unshakeable intention to possess a nuclear deterrent, whether self-made or purchased, and outlined the first five-year military programme law containing 770 million francs for a strategic missile programme.[4] At the same time the passage into a phase of active development and production of launcher missiles was confirmed institutionally in 1959 by the creation of the *Société d'études et de réalisation d'engins balistiques* (SEREB), a limited company with the state as its majority shareholder in partnership with most of the French firms with a potential or actual interest in missiles and satellite launchers. SEREB had a ten year brief to stimulate and mobilize the nascent space industry and to manage the production of the first ground-based missiles of the deterrent force. This activity was under the authority (*'tutelle'*) of the armed forces bodies responsible for missiles, and after 1962, in cooperation with the newly created French national space agency (CNES).

The return to power of General de Gaulle in 1958 gave renewed impetus to the nascent atomic and space industries, through a heightened awareness of their importance to each other and to France. Already in late 1957, in an indication of the importance attached to the atom and space the responsibility for Atomic and Space questions had come under direct Prime Ministerial control, first under Félix Gaillard as *Président du Conseil* (November 1957), and then, in June 1958, de

Gaulle himself assumed authority, before appointing Jacques Soustelle as the *Ministre délégué auprès du Premier Ministre* in January 1959. At the same time, the *Comité de Recherches spatiales* was created with the brief of evaluating the range and nature of French space activites, and of presenting a report for action to the Prime Minister. Headed initially by Pierre Auger, the Committee was attached to the influential *Délégué Général à la Recherche scientifique et technique*, at the time Pierre Piganiol, co-author in 1963 of Pour une politique scientifique, the crucial contribution to France's debate on the place of science and technology in the 1960s which we discussed in the Literature review. In conjunction with the first *'Loi de Programmation militaire'* of 1961, the Committee's report determined the move towards the creation of CNES and the trends and volume of French space activities until 1965.

3.1.2. 1959 : the *Comité de recherches spatiales*

Created by decree on 7 January 1959, the *Comité de recherches spatiales* was the first institution set up with responsibility uniquely for questions relating to space.[5] The Committee assisted the *Présidence du Conseil* and the *Délégué Général à la recherche scientifique et technique.* Its composition was determined by the presence of representatives of organisations with technical competence in space activities or a specific interest in the applications of space technology, and by government representatives from Ministries involved in space activities. The Committee thus grouped the *President of the Comité d'action scientifique de la défense nationale* (CASDN), the Director General of the *Office national d'études et de recherches aéronautiques* (ONERA), the Director of the *Centre national de la recherche scientifique* (CNRS) and the head of the Paris Observatory. The controlling Ministerial authorities were represented by the Director General of the *'Affaires culturelles et techniques'* department of the Foreign Ministry and by an official from the Finance Ministry. The *Comité* was thus a prestigious body intended to reflect the importance given by de Gaulle to high technoogy and space.

The brief of the *Comité de recherches spatiales* was threefold: firstly its members had to take stock of the capabilities for space research existing in France and were secondly to prepare and present to the Prime Minister a programme of space research; thirdly, the Committee was to direct the implementation of the programme once accepted by the government. The group was also meant to act as a clearing house for information, being informed of all national and international activities in the field of space research and

communicating this intelligence to the government. As a small scale prototype of a national space centre, the *Comité de recherches spatiales* was short-lived. Even before the legal creation of CNES in December 1961, the statutes of the Committee were abrogated and replaced by a new set of regulations. The decree of 3 July 1961 in effect brought the Committee under the direct authority of the Prime Minister and the *Délégation générale à la recherche scientifique et technique* (DGRST) and much enlarged both its membership and its missions.[6] The membership, enlarged to 22 in addition to the president Pierre Auger, again represented the controlling Ministries but with an increased participation from the Foreign Ministry, whose Director General of Cultural and Technical Affairs was seconded in his work on the Committee by the head of the *Service des Affaires spatiales* of the same Foreign Ministry. Representatives from the *Délégation ministérielle à l'Armement* (DMA) and the Defence Ministry numbered four in total (Director of the DRME, Director of the *Département Engins* of the DMA, Chief of General Staff *interarmées*, representative of the Chief of General Staff of National defence). The missions of the Committee were increased, adding an advisory capacity to the Prime Minister and and a rôle of coordinating interministerial interest in space matters to the responsibilities of assessment, planning and management introduced in the original decree of January 1959.

During 1959 and 1960 institutional moves were thus being made towards the creation of CNES following the model created by the United States with NASA, an agency intended to manage scientific and technological activities concerning space. As well as the *Comité* and SEREB, other interest in space was burgeoning, as witnessed by Professor Etienne Vassy's Space Physics team at the *Université de Paris*, and Professor Alfred Kastler's '*Service d'aéronomie*' in the CNRS. The need for a coordinating body in the field of space science and research that had led to the creation and subsequent enlargement of the *Comité de recherches spatiales* continued during 1961 as the importance of all aspects of space technology and its applications were increasingly perceived.

3.2. The 1960s : CNES, the *Force de frappe* and *'tous azimuts'*

After what can be called the 'initial' period of the immediate post-war era and the 1950s, when France was still recovering from the destruction of the war and the political problems left by occupation and collaboration as well as coping with the debilitating effects of colonial wars, the 1960s were marked by more stability in politics and society and by growth in the economy, under the leadership of de

Gaulle. In military and civil space, much progress was made. Below we consider the creation of the *Centre national d'études spatiales* in 1961-62.

3.2.1. 1961-62 : the *Centre National d'Etudes spatiales*

Prior to the eventual physical creation of CNES in 1962, a number of laws and decrees of 1961 and 1962 defined its objectives, its administrative and financial workings and its accountability. Under the influence of de Gaulle, Prime Minister Michel Debré and Pierre Guillaumat (from March 1960 *Ministre délégué auprès du Premier Ministre* for space) the project of creating CNES was approved by Parliament, becoming law in December 1961. Officially instituted by the Law no. 61-1382 of 19 December 1961, the original form of CNES was established in two steps; firstly the initial Act of December 1961, and secondly, the Decree no. 62-153 of 10 February 1962 which defined the administrative and financial workings of the Centre.[7]

The first article of Law 61-1382 declared that *'Il est institué sous le nom de Centre national d'études spatiales un établissement public scientifique et technique à caractère industriel et commercial, doté de l'autonomie financière et placé sous l'autorité du Premier Ministre'*. This is the most succinct definition of what might be termed the *'modèle fondateur'* of CNES, and which still contains in essence the key to CNES's rôle, activities and problems. CNES's objectives were five in number: firstly to act as a clearing house for information on national and international space matters; secondly to prepare national research programmes for presentation to the *Comité interministériel de la recherche scientifique et technique* (CIMRST); thirdly to undertake the execution of the programmes; fourthly to monitor international space cooperation (in partnership with the Ministry for Foreign Affairs); and fifthly, to ensure the publication of scientific papers dealing with space matters.

Although CNES was set up with the obvious responsibility of managing the the space sector for the state, its theoretical accountability to government was clearly set out, in terms of finance and in terms of the monitoring of the agency's decisions and activities. Article 3 of the founding law instituted the autonomy of the Centre concerning the management of its finances, which were essentially to be drawn from the funding envisaged for space research in the *Loi de programme d'actions coordonnées de recherche scientifique et technique* or scientific research law of May 1961. Funding was also immediately available through the *Fonds de*

développement de la recherche scientifique et technique of the Prime Minister's budget, CNES taking over responsibility for the space research agreements concluded within this structure. The theoretical responsibility of the Centre to Parliament was set out in Article 6, which required the submission of an Annual report by the Centre on its activities and results to be available before the annual budgetary debates in the Assembly.

The administrative and financial working of the Centre was exposed in considerably greater detail two months later on 10 February 1962 in Decree 62-153. Compared with the composition of the *Comité de recherches spatiales*, the CNES Board of Administration again revealed the desire of the government to reflect the pluridisciplinary nature of space activities in the institutions, care being taken to include in representation the fields of science and technology, industry, the Ministerial technocracy and the Armed forces. Thus the *Conseil d'Administration* of the new agency was to be composed of the Director General of the CNRS, the Director of the Paris Observatory, the Director of the *Direction des recherches et moyens d'essais* (DRME) at the Army Ministry, four members with specific relative scientific or industrial expertise, and three senior civil servants representing the principal Ministries involved in the activities of CNES.[8]

The *Comité de recherches spatiales*, (modified already in July 1961) was further transformed into the *Conseil de l'Espace* through the notable addition to its personnel of the very senior *Commissaire Général du Plan*, the *Délégué Général à la recherche scientifique et technique* and the *President of the Comité d'action scientifique de défense*. Prestigiously structured in this way, the *Conseil de l'Espace* took on a consultative rôle to CNES, whose President was also its own chairman. The *Conseil* met at the request of the President of CNES in order to deliberate on the content and execution of projected CNES programmes, the comments of the *Conseil* being taken into account in the final settlement of plans. Thus assisted by the *Conseil de l'Espace*, the President and the *Conseil d'Administration* of CNES were to be answerable to government on a number of levels. Firstly, the discussions of the CNES administrators included the participation of the *Délégué Général à la recherche scientifique et technique* and the *Contrôleur d'Etat*. In this way, the scientific interest of CNES activities was monitored at the highest level of the institution's decision making structure, and the economic and financial ramifications of its planned and existing programmes were examined by the Finance Ministry.[9]

Furthermore, in accordance with Article 6 of the Founding law, Article 11 of Decree 62-153 provided the detail of the procedures involving CNES's responsibility to Parliament through its Annual report which was to be examined by

the *Conseil d'Administration* before being sent to the Minister attached to the Prime Minister and to the Finance Minister before being transmitted by the former of these to Parliament itself.[10]

The financial organisation of the Centre was to be monitored by a *Contrôleur d'Etat* reporting to the *Ministre délégué* and to the Finance Ministry (Article 12), with provision being made for the future detailing of this framework in a joint *arrêté*. This joint *arrêté* of 29 August 1963 established that CNES was subject to the rules and regulations of Public accounting, as set out in the decree dealing with the issue of 29 December 1962. The *arrêté* stressed that funding for CNES was to be based on annual forecasts of receipts and expenses, the forecasts distinguishing between costs incurred in the functioning of the Centre and capital investment costs.[11] Such a framework of controls, checks, balances and inspections reflected a belief in the importance of the space sector and in the need for a strong and autonomous, (but not necessarily overly-independent) space agency to administer its development.

Physically, CNES came into existence on 1 March 1962, the seventeen staff headed by Director-General Pierre Aubinière, President Pierre Auger and Technical Director Professor Jacques Blamont. Aubinière was a refugee from the armed forces, being an *ingénieur de l'armement* whose former responsibility had been that of heading the *Direction technique des Engins* at the *Ministère des Armées*, whilst Auger was a civilian scientist who had contributed to the setting up of CERN as well as having headed the *Comité de Recherches spatiales*. Thus from the beginning, the two future trends of space activites, namely national-military and civil-European, were present in embryo in the CNES organigramme.

The creation of a new institution such as CNES to manage the space industry, rather than adapting already existing structures such as SEREB indicated an apparent will on the part of government to move away from the essentially military origins of space technology and the continued influence of the armed forces which was being exerted through the development of the deterrent force. As we have seen, the one existing civil body concerned with space was transformed on the creation of CNES in order to exercise a consultative rôle to the new agency, the *Comité de Recherches spatiales* becoming the *Conseil de l'Espace*.

Under the terms of the Loi 61-1382 CNES was to be a state technical and scientific establishment charged with bringing French space research up to a truly international level and developing French technological and industrial capabilities in aerospace to international competitiveness. CNES also had an industrial and commercial brief implied in the second part of its title as an *'Etablissement public scientifique et technique à caractère industriel et commercial'*, but in reflection of

the weighting of its activities at this early stage in the development of the 'space industry' was dependent initially on the Ministry of Scientific research and Atomic and Space questions (headed by *Ministre d'Etat* Gaston Palewski) which exercised the *tutelle* for space matters until February 1965.[12]

The initial practical development responsibility of CNES was the encouragement of French satellites and launchers, the government having accepted SEREB's December 1961 proposal to develop the *Diamant* launchers. In May 1962 an outline agreement between the DMA and CNES set out the division of responsibilities of the two institutions in the programme under the prime contractorship of SEREB. Before the first launch of the *Diamant* rocket in November 1965 and the launch of the first French scientific capsule (*A1 Astérix*) by an American launcher in December 1965, cooperative European space activities were initiated with the creation of the European Launcher Development Organisation (ELDO) and the European Space Research Organisation (ESRO) in March and June 1962 respectively.

If the creation of CNES by the new Gaullist régime may be seen as an institutional innovation representing the state's desire to involved (indirectly through an agency) in the planned development of the space sector, militarily, the early 1960s also witnessed new approaches to planning deriving from Gaullist thinking. Institutionally and organisationally, the military program laws were one of the major innovations.

3.2.2. 1960-64: The first *Loi de Programme* and the *Force de frappe*

During the second period in the development of the space sector, the influence of de Gaulle in the development of the nuclear force simultaneously stimulated military and civil space efforts. The period of the first *Loi de programme* provided the earliest and most classic formulation of Gaullist nuclear strategy, the doctrine of the 'national sanctuary' being elaborated in the early 1960s notably by Armed Forces Minister Pierre Messmer and by General Jean Noiret, Inspector General of the Army. In 1963, General de Gaulle voiced the notion of two battles, one in the 'forward' areas of Europe, in which French conventional and possibly tactical forces might be engaged, and the second battle representing the defence of France itself by strategic nuclear forces.[13] Technologically, this doctrine implied the need for long-range bombers and for ground-to-ground strategic ballistic missiles ('sol-sol balistique stratégique' = SSBS) with a range sufficient to reach the presumed Eastern enemy. The terms of the *loi de programme* 1960-64 also implied the development of sea-to-land long-range ballistic missiles ('mer-sol

balistique stratégique' = MSBS) as part of a *'tronc commun'* research programme with the SSBS missiles. Initially in 1964, the number of ground-based missiles was set at fifty-four silos, but by 1971-72, when the first 3000 km range S-2 missiles were entering service their number had been reduced to a mere eighteen from an intermediate revision in the second programme law to twenty-seven.[14]

In general, this period shows how the aeronautical element of the *Force de Dissuasion* was ultimately fated to be replaced by rockets and space rather than by air-reliant systems. Despite the place of the long-range bomber as a component of the triad of vectors available for the nuclear force, and its survival into the 1980s and 1990s, the long-term future of the nuclear force was soon seen to lie in space related technology. In an article by Air Force General André Martin in 1964 intended to reinforce his service's claim on the *'bombinette'*, we can rather ironically find one of the early references to the militarisation of space: the main thrust of Martin's argument was that the missile could never replace the manned plane, an unfortunate conviction somewhat compensated for by the prescience with which he evoked the potential rôle of space in information gathering and telecommunications.[15] With the near simultaneous creation of the *Centre national d'études spatiales* (CNES) and the *Délégation Ministérielle de l'Armement* (DMA) in 1961 and 1962,[16] the second period of the development of the space industry was marked by the separation of the civil and military establishments theoretically responsible for their respective sectors, even if the practice of the space industry overall was still marked by the military origins of space technology. This institutional separation of the organisations marked the belief that space was not just a military concern, but that it was of great civil importance to the economy and society as a whole.

3.2.3 1965-1970 : the second *Loi de programme* and *'tous azimuts'*

During this period France pulled out of practical involvement in the NATO Alliance's integrated military structure. This decision, taken in 1966, was intended to distance France from a perceived constraint on her independence of military action, and as such was consistent with the views expressed earlier by Messmer and Noiret and the decision to procure tactical and strategic nuclear weapons. The strategic doctrine of the 'two battles' implying the need for strategic and tactical nuclear vectors offered France the option of potential non-belligerency in a European conflict since theoretically her troops could remain just beyond the frontiers, not becoming involved in actual conflict until the last moment before the violation of the sacrosanct national territory. The proposition made in December

1967 by Air Force General Charles Ailleret that France should develop a massive strategic nuclear force capable of dissuading atttacks originating in any part of the world may be seen to be itself a logical extension of the two battles/sanctuarisation doctrine.[17]

The *'Tous azimuts'* - "all points of the compass" concept suggested by Ailleret, which (perhaps unfortunately for the French space industry) was never accepted as a basis for operational planning, would have necessitated the development of intercontinental ballistic missiles of 10 000 km range in large series. Ailleret's recommendations were based on his analysis of the likely geo-strategic developments of the next two decades. The long term view which was taken by Ailleret, which means that his reflections on the future as he envisaged it dealt with the 1980s, is characteristic of his celebrated article.[18]

The planning and prospection of future trends that Ailleret supported has been echoed in recent structures created within the Ministry of Defence in the mid-1980s. Had the *'engins balistiques mégatonniques à portée mondiale'* called for by Ailleret been produced (series production was planned for 1980, with entry into service during 1985-90), the face of the French space industry might have been somewhat different. Ailleret had no doubts that his recommendations were actually feasible; the effort required had to be carefully evaluated, but was imperative if France was to retain her independence of action.

Given perennial concerns over France's independence of action in launching missiles against Moscow without relying on American cooperation for navigation and positioning data from US satellites, Ailleret's prescience in indicating the *'extrapolation spatiale'* of his ICBM project in particular and of strategic defence in general seems to have been ignored throughout the 1970s at the cost of the credibility of French defence. "*Tous azimuts*" would have been possible through the development of a large-scale intercontinental missile capability and of spatial forces.[19]

The rejection of Ailleret's *'perspectives hardies'* as Lothar Ruehl terms them[20] was a negative turning point for the development of the French space industry and for French military space activities. Defence Minister Messmer rejected the specifically space oriented aspects of *'tous azimuts'*, unaware of the future importance of military space.[21] Air Force General Michel Fourquet, in a classic restatement of French nuclear strategy, rejected the notion of ubiquitous threats to France in favour of the traditional Soviet menace. Coming twelve months after Ailleret's death in an aeroplane accident, Fourquet's speech before the IHEDN in March 1969, in omitting to make mention of *'tous azimuts'* marked the disappearance of the concept as an issue of debate.[22] The most positive reaction

to *'tous azimuts'* came from the then President of the *Revue de Défense nationale*, Edmond Combaux, who, in attempting to reconcile the concept with *'le sens de la mesure et de la raison'* arrived at conclusions which interestingly prefigured measures instituted in the 1980s in civil and military high-tech cooperation in Europe.[23] Combaux's "reasonable" perspective proposed European concertation; an *'espace politique et militaire élargi'* in which the French would ring in a scientific renaissance through the fostering of all means of developing high technology such as space.[24] Indeed, for Combaux, the *'tous azimuts'* concept *'prendra toute sa valeur comme doctrine de défense commune de l'Europe d'Occident'*.[25] Combaux's subtle analysis of the situation in 1968 was as far-sighted as Ailleret's own concept of *'tous azimuts'*. Its merit is to have anticipated the cost-constraints of the 1980s, extrapolating forwards in time from the 1960s context of an overt separation of military and civil space (and a striking restatement of France's need to be militarily independent through space), to the situation of the late-1980s and 1990s where military-civil and international collaboration has been seen to be increasingly necessary to maintain the technological, economic and political place of France and Europe in the world.

Given this strong emphasis on France's modernisation as a military power during the years of de Gaulle, it is indicative of the importance accorded to fostering civil space as well that the French space effort also engaged in the multilateral space science and launcher initiatives of the newly created European space organisations such as ELDO and ESRO. French space activities also undertook bilateral cooperation, for example with the Federal Republic over the Franco-German telecommunications satellite programme *Symphonie* (Convention signed 6 June 1967). CNES also collaborated with the US and Soviet space programmes. Throughout this early period, CNES's existence as a new institution responsible for what was essentially a new field of government concern was threatened by the presence of existing competence in the sector, notably the considerable military experience of launcher technology and also to a lesser extent the influence of organisations such as ONERA with know-how in related fields which might have been transformed into a space agency had the decision not been taken in 1961 to create an institution *ex nihilo*. As an illustration of this situation, in 1966 CNES won a struggle to take authority for the *Diamant* launcher programme away from the armed forces bodies involved in its management . This meant that the political decision to create CNES was backed up by the presence of the political will to support the activities of the new organisation. The late 1960s saw the implementation of the *Diamant B* programme and the establishment of the (civil) Toulouse Space Centre (CST).

In the background to the debate over *tous azimuts,* CNES was evolving quietly during the late-1960s, and specifically in 1968 two decrees slightly modified the dispositions of Decree 62-153. The effect of these modifications of CNES's statutes was to extend the range of Ministries involved in CNES activities - an indication of the far-reaching nature of space research and industry.[26]

3.3. The 1970s : consolidation in military and civil space

The 1970s represented the first period of what could arguably be termed the mature phase of French space activities, after the beginnings of development of technologies in the 1940s and 1950s and after the 'heroic' phase of institutionalisation and expansion during the 1960s. Politically and economically, the period was marked by the Pompidou presidency, under which much action was slowed by the transition from the Gaullist period to Pompidou (and then Pompidou's illness) and subsequently by the Presidency of Giscard d'Estaing, under which France suffered the effects of the oil crises.

1970 saw the first assessment of CNES progress and the first attempt since the recommendation of the *Comité de Recherches spatiales* and its six year plan in the early 1960s, to plan future trends in French space activities. The 'Aigrain report' presented to the government in March 1970 led to the choice of pursuing European collaboration within the context of ELDO and ESRO and of emphasizing applications satellites and launchers. The decision to go European was determined by the costs of space programmes, perceived to be beyond the capacities of a medium-sized power such as France shaken by the social and financial disturbances of 1968-69, and by the belief that by playing a leading rôle in the development of the European space industry France could retain her *'autonomie'*[27] in space technology if not the *'capacité autarcique'* represented by the otherwise shining example of the domestic nuclear programme.

3.3.1. 1971-75: the third *Loi de programme* - consolidation in military space

The period of the third *Loi de programme* saw the confirmation of the Fourquet doctrine by Defence Minister Debré, and a certain amount of continuing controversy over the choice of delivery systems despite the rejection of the idea of producing ICBMs by the Pompidou, Chaban-Delmas and Debré administration in 1969. The departure of de Gaulle, who was seen as the *'éminence grise'* behind Ailleret's advocacy of global range arms and the militarisation of space removed

the last support for the notion of *tous azimuts* in the preparation of the third *Loi de programme*, although the government covered itself by pledging its will to maintain studies and research for future exploitation. For Ruehl, this marked tacit acceptance of the impossibility of bearing the financial and technical burden of ICBMs.[28] The government at the time was effectively avoiding the question of the future importance of space in nuclear defenc,e as illustrated in a 1970 report to the Defence Commission of the National Assembly.[29]

Ruehl concludes that despite the technical and industrial capacity to produce ICBMs, and the existence of credible military justifications for their development, financial considerations were the primary cause for the rejection of *tous azimuts*. The symbolic efficacy (as opposed to its destructive potential) of the launcher site on the *Plateau d'Albion* in Provence was also confirmed during the funding crisis of this period by the installation of a mere eighteen S-2 SSBS in 1971-72, a third of the initial number called for in 1964.

According to Admiral Sanguinetti, an issue inspired by *tous azimuts* also arose in 1973-74, under the form of a request by the *Etat major de la Marine* that the replacement for the submarine-launched M-20 should have an increased range of 7000 km and a single thermo-nuclear warhead, (the M-4 missile having originally been envisaged by the DMA under the Pompidou Administration with a range of 4000+ km).[30] The justification for the increased range demanded was that the French withdrawal from the integrated military command of NATO implied an at least theoretical equal appreciation of danger from Soviet and US actions, and that in practice, if the real threat was likely to come from Moscow, longer range missiles would allow submarine patrols in waters more easily controlled by France than permitted by the 4000 km limit. The rejection of the request was a function of political unease at its similarities with *tous azimuts* and because of the DMA's interest in developing multiple-warhead technology for the M4.[31]

The period of the third *Loi de programme* was thus a time of relatively little forward movement in terms of either strategy or technology, the preparation of the military plan being affected by political, social and monetary uncertainty. In civil space, the situation was troubled by the difficulties of the ESRO and ELDO organisations, whose French-led restructuring into ESA gave the concentration on civil European space activities of the Giscard d'Estaing Presidency.

Giscard d'Estaing's Presidency was marked by two significant debates over strategy and by French efforts towards the commercial development of the European Space Agency launcher Ariane. Neither the refinements brought to nuclear strategy nor the Ariane programme affected substantially the relationship between civil and military space in France which had evolved during the late 1950s

and the 1960s, namely that of official separation between the two sectors (represented by the presence of twin technical and scientific agencies in the form of CNES and the DGA), but a persisting historical influence of the military origins of the industry overall on the development of the civil sector.

Militarily, France was also involved in some greater interaction with her European neighbours. In 1976 the concept of *'sanctuarisation élargie'* was considered by the President and his Chief of Staff General Méry; under this doctrine the deterrent protection afforded France by her strategic weapons would be extended to NATO allies. In 1980 a further potential refinement was voiced, namely the *'oeuvres vives'* concept targeting specific military and government objectives in the USSR. Neither of these notions was actively adopted, and French declaratory policy returned to the traditional statement of strategy, with, under Mitterrand, a tendency towards resanctuarisation.[32]

3.3.2. Europeanisation - consolidation in civil space

Although the initial founding statutes were those of 61-1382 and 62-153, we have seen how these were preceded by the creation and modification of the *Comité de recherches spatiales* and themselves subsequently adapted on certain points by *arrêtés* and decrees in 1963 and 1968. Thus by the 1970s CNES statutes had reached an initial temporary equilibrium.[33] However, the 1970s were a period of rapid developments in Space policy and in the nature of the space industry, a phase of early maturity for the sector built up since the late 1950s from exclusively military origins to increasing economic, strategic, diplomatic and scientific importance. The end of the 1970s thus represented the first settled form of CNES's organisation, administration and functioning after the first rectifications of the 1960s and the later additions of the 1970s.

In January 1976 a number of modifications were made to CNES's statutes, reflecting the perceived change in the nature of space activities more and more towards practical applications of technology. The span of ministerial interests involved in space activities was represented by the large number of 'user' ministries involved in the *Conseil des applications* advising the Industry and research ministry, which exercised authority over CNES.[34]

Whereas the *Conseil* exercised an advisory and consultative rôle in informing the Industry and Research Ministry on various implications of CNES activities, the appointment of a government Commissar to oversee the running of CNES evidenced a strong Ministerial desire not to go unawares of developments within the Space Agency. Financially, the Ministry still provided the funding for CNES

which was supplemented (article 11) by '*fonds des contrats sur programmes*' undertaken with the DGRST or with various Ministerial departments involved in space applications. This represented the beginning of CNES 'own resources' *('ressources propres')* combined with payments for services rendered making up the agency's degree of financial independence from its controlling Ministries.[35]

The international dimension of space activities was becoming increasingly important, given France's dynamic approach to European cooperation, leading to the creation of the European Space Agency from ELDO and ESRO. The two strands of the French strategy suggested by the Aigrain Report of 1970 were expressed in the *Conseils restreints* held at the end of 1972 and 1974. In November 1972 the government decided to propose the 'Europeanisation' of the L III S launcher to its European partners in the troubled ELDO. In October 1974 the *Diamant* programme was scheduled for abandonment along with others because of its costs. Bilaterally, the *Symphonie* satellite was launched in December 1974, whilst French leadership in ELDO and ESRO led to the resolution of their successive 'crises' through the May 1975 creation of the European Space Agency (ESA). Over the period of these crises (1971-73) France was contributing a third of the CNES budget to cooperative European projects. In 1977, two years after the creation of ESA and three years after the decision to undertake the Ariane programme, France was contributing 34% of total ESA funds, and no less than 62.5% of the cost of Ariane was coming from CNES.

3.3.3. Space policy as 'insurance'

The 1970s were primarily the decade of the preparation of Ariane, built for the ESA by CNES working as prime contractor. France's near monopoly of Ariane gave the lie to the apparent new all-European face of space activities. Although it is not our purpose here to discuss the European aspects of French space policy, it must be pointed out that out of the ESA projects, Ariane was that with the highest 'independence content' in strategic, military, industrial and commercial terms.[36] In comparison with the Spacelab for example, in which West Germany was advocating collaboration with the US and with the limited enthusiasm of the UK who was only committing herself to a maritime satellite communications system, France's support for Ariane represented the guarantee of strategic launcher autonomy from the US and the furtherance of French expertise in ballistics and missile propulsion useful for maintaining the credibility of the deterrent force. Indeed, because of the relatively tried and tested nature of much of Ariane's technology, the proportion of purely scientific and technological interest in the

programme was perhaps all the smaller in comparison with its strategic military and commercial importance. Despite rhetoric from France that French space policy was European space policy[37], it is generally accepted that French motives for European cooperation were not motivated solely by a desire for integration. France's space policy during this period was an 'insurance policy' by which she contributed to maintaining French national science, industry and defence at levels above those which would have possible without cooperation in European space.[38]

Overall, the later 1970s were characterized by attempts to foster a solid 'commercial' basis to the space industry at the beginning of the 'applications era' that was expected to be opened in the 1980s. Ariane represented the flagship of this movement into the provision of space 'goods and services' as it was believed that there was a 'market niche' for a commercial launcher of the satellites whose usefulness had been proven by the successful telecommunications satellite programmes such as *Symphonie.* Military aspects of space utilisation apparently took a second place in government preoccupations, although some studies were effected by the armed forces into satellite communications. Official positions on the militarisation of space stressed the need for peaceful applications and for the restriction of superpower military applications in favour of the control of space by the international commmunity, although how genuine these were in reality, we shall see in following chapters.

The beginnings of real social and economic effects of space activities on French society were inaugurated with the decision of the *Conseil économique et social* to authorize the launch of the SPOT earth observation programme (19 September 1977), the establishment of a protocol of agreement between the Ministry of Posts, Telephones and Telecommunications and the DGA for the management of the *Télécom 1/ SYRACUSE I* telecommunications satellite system (20 March 1978) and the creation of *Satel-Conseil* (31 July 1978), a CNES subsidiary acting as an engineering and business consultancy promoting French satellite sytems and services. In 1979, with the approaching readiness of the Ariane launcher as a 'commercial' viability the government decided to modify CNES's missions and brief in conformity with the expected onset of the era of 'commercial space'. At the *Conseil restreint* held on 20 February 1979 it was also decided that Ariane should finally be produced and commercialized by a new body, and that *Télécom 1* should be launched. The first Ariane launch was effected on 24 December 1979, and the Arianespace CNES subsidiary company was instituted in March 1980.

3.4. Conclusion

In conclusion we can suggest that the historical context of French Space in the 1980s and 1990s is one that melds essentially military origins and a real and continuing link between nuclear deterrence, space technology and French independence with a gradual waning in the overt military importance of space (periodically reversed) in favour of a move towards commercial applications. Pointers for the future development of the the French space effort that we can find in the period 1945-1979 include the periodically somewhat confused relationship between civil and military activities, the sometimes problematic interaction between the civil space agency CNES and military bodies concerned with space technologies such as the DGA, the continuing debate over the place of space in French defence strategy, and finally the evolving nature of CNES as an *Etablissement public industriel et commercial* (Epic) and its links with government. (The most general feature that this historical background suggests is of course France's use of Europe as a context within which to develop national space policy)

In analytical terms, over the thirty year period of its operation, CNES's history illustrates the complex relationship obtaining between the state and state-created 'Colbertist' institutions leading semi-autonomous existences in the high-tech sector. Innovations and developments relative to CNES in the 1980s indicative of the French state's desire to manage these trends in the space sector in the best overall interest of French society and France as a nation are examined in subsequent chapters.

The following chapter presents the French space industry as it has become in the 1980s and 1990s in simple quantitative and structural terms, before the thesis moves on to analyse the making of space policy by CNES and government in the civil sector and by the DGA and the armed forces establishment in the military sector.

Notes to Chapter 3

1 The *'loi de programme'*, was an innovation of military planning brought about by de Gaulle, who hoped that the five year terms of planning would increase the direction and stability of France's defence policy.

2 'France's Force de Frappe', Interavia, XIX, June 1964, p.798.

3 Fourquet, General M., 'La Politique d'armement à long terme, Revue de Défense nationale (May 1957), pp.

4 Charles de Gaulle, Discours et Messages (Plon ,1970), Allocution prononcée à l'Ecole Militaire le 3 novembre 1959, pp.125-129.

5 Décret du 7 janvier 1959, Journal Officiel 8 January 1959, pp.565-566.

6 Décret 61-703 du 3 juillet 1961, Journal Officiel 7 July 1961, p.6182.

7 Loi 61-1382 du 19 décembre 1961, Journal Officiel 20 December 1961, pp.11665-11666. Décret 62-153 du 10 février 1962, Journal officiel 11 February 1962, pp.1484-1485.

8 In terms of the actual personalities appointed, the first president of CNES was Professor Pierre Auger, assisted by Jean Coulomb (CNRS), André Danjon (Paris Observatory), Maurice Pascal (Marine engineer), Jean Voge (Telecommunications engineer), Lucien Malavard (DRME), and Professor Pierre Grivet (Paris University). The Conseil d'Etat was represented by Jean Donnedieu de Vabres, the Service des Affaires spatiales of the Foreign Affairs Ministry by Jean de la Chevardière and the Finance Ministry by Pierre Magniez.

9 Secondly, the minutes of the meetings themselves were transmitted to the *Ministre délégué auprès du Premier Ministre*. This closeness of the examination of CNES activities shows the great concern on the part of government to know what CNES was planning and to try to direct the actions of the agency in the ways most profitable to the state.

10 Because the subjects set out by article 4 of the Decree for debate within the *Conseil d'Administration* were likely to produce decisions and directives for action, article 5 set out the restrictions exercised by the Finance Ministry and the Prime Ministerial delegate Minister. The *Ministre délégué* had the power of veto over all deliberations not automatically requiring Ministerial clearance, and, specifically, income and expenditure forecasts, profit and loss accounts, loans, financial participations and personnel management required authorization from Finance Ministry and *Ministre délégué* jointly.

11 Art. 2. In addition, article 8 stipulated the condition of contracts between CNES and outside organizations, fixed by the *Conseil d'Administration* in accord with the general rules of Public sector contracting (*marchés de l'Etat*), they were to be monitored by a *Commission des Marchés* within CNES appointed jointly by the Finance Ministry and the Minister of State for Scientific research and Atomic and Space questions.

12 It is generally considered that the designation 'Ministry of State' implies importance of either the Minister or the portfolio concerned.

13 See Yost, David S, France's Deterrent posture and security in Europe. Part I: Capabilities and doctrine, Adelphi Paper No. 194 (IISS,1984), p.5.

14 Ruehl, Lothar La politique militaire de la Ve République (FNSP,1976), p.297.

15 Martin warns that *'Il faut dès maintenant penser au futur. L'utilisation militaire de l'espace fournira peut-être une réponse mais encore très lointaine et peut-être au delà des limites de nos possibilités'.(p.1509)* Martin, *'L'Armée de l'air dans le contexte nucléaire'*, p.1518 : *'Il ne peut y avoir controverse, l'engin ne saurait remplacer l'avion de pénétration mais seulement le compléter pour l'attaque systématique des objectifs fixes, d'assez grande étendue ou très fortement défendus'*. And p1510 ; *'...des moyens de reconnaissance seront évidemment nécessaires. Avant que l'espace soit en mesure là encore de fournir une solution satisfaisante, l'avion de reconnaissance continuera à être irremplaçable'*. Martin, Général André, L'Armée de l'air dans le contexte nucléaire Revue de Défense nationale, October 1964, pp.1499-1517, p.1509.

16 For discussion of the DGA, see Chapter 9. (The organization and funding of military space activities. For discussion of CNES, see Chapter 5. (CNES rôle and organisation, activities, funding and budgets).

17 Ailleret, Général Charles, Défense dirigée ou défense "tous azimuts", Revue de Défense nationale (December 1967), pp.1923-32.

18 For example, *On ne réalise pas une défense et les moyens de cette défense, qui résultent les uns et les autres - et en particulier les armées, leurs armements et leurs doctrines - pour le lendemain du jour où l'on se met au travail. On les organise à la fois pour le lendemain imminent et pour un lointain avenir, ce qui pose des problèmes de choix particulièrement difficiles lorsque le monde évolue à la vitesse d'aujourd'hui. Si nous concevons actuellement la mise sur pied d'une défense, celle-ci ne sera guère réalisée complètement que dans vingt ans. Quelle sera alors la situation du monde à cette époque?* Ailleret, 'Défense dirigée ou défense "tous azimuts", p.1927.

19 In Ailleret's terms, *'en développant notre actuelle force nucléaire stratégique pour en faire une force thermonucléaire à portée mondiale tous azimuts et ceci dans des conditions qui lui permettraient de s'extrapoler ensuite lorsque ce sera nécessaire et possible en forces spatiales, à une époque où l'utilisation militaire de l'espace sera devenue une réalité'*.Ailleret, Défense dirigée ou défense "tous azimuts", p.1931

20 Ruehl, Op. cit., p.231.

21 Messmer, Pierre 'L'Atome, cause et moyen d'une politique militaire autonome, Revue de Défense nationale (March 1968) pp.395-402.

22 Fourquet, Général Michel, Emploi des différents systèmes de forces dans le cadre de la stratégie de dissuasion, Revue de Défense nationale (May 1969), pp757-767.

23 Combaux, Edmond, Défense Tous Azimuts ? Oui mais..., Revue de Défense nationale (November 1968), pp.1600-1617.

24 *'moyens... pouvoirs... responsabilités... programmmes des laboratoires privés ou d'Etat, nationaux ou fédéraux, qui travaillent au développement de nos techniques les plus avancées: physique nucléaire, éléctronique, biologie, conquête de l'espace'*. See Combaux, 'Défense Tous Azimuts ? Oui mais...', p.1615.

25 Combaux, Op. cit., p.1517. My emphasis.

26 Initially (14 February) abrogating the final alinea of article 3 providing for the joint presence of the *Délégué Général à la recherche scientifique et technique* and the *Contrôleur d'Etat* at meetings of the CNES *Conseil d'administration*. Henceforth, only the *Contrôleur d'Etat* was to attend. Also of note in this decree was the fact that the modifications were instituted on the report of the Prime Minister, the Ministry of Foreign Affairs, the Ministry of National Education, the Ministry of the Economy and Finance and the Delegate Minister for Atomic and Space questions. Late in 1968, Decree 68-853 (25 September) modified the composition of CNES's *Conseil d'administration*, enlarging it to include not only the *Délégué Général à la recherche scientifique et technique*, the Director General of the CNRS and that of the DRME but also the head of the National Astrophysics Institute, four experts in fields of activity relevant to the work of the Centre and five civil servants.

27 *Conseil restreint*, 14 May 1970.

28 Ruehl, Op. cit., p.300

29 de Bennetot, M., Rapporteur, Rapport de la Commission de Défense nationale, Assemblée nationale, Doc. No. 1372, annexe au procès-verbal de la séance, 2 October 1970, p.39. *Pendant la durée du troisième plan, la France ne procédera pas à la construction de missiles de longue portée et se limitera à poursuivre à ce sujet, les études qu'elle a entreprises. On sait que le système de lancement d'un missile de longue portée peut être utilisé pour mettre sur orbite des satellites de reconnaissance ou de télécommunications dont l'intérêt militaire n'a pas besoin d'être souligné. Le gouvernement a décidé dans ce domaine de ne pas procéder à des fabrications.* Quoted in Ruehl, Op. cit., pp.300-301. My emphasis added.

30 Interview, 3 September 1989.

31 Interview, Admiral Sanguinetti, 3 September 1989.

32 See Yost, Op. cit., pp.7-9.

33 This initial temporary equilibrium was between the initial military origins of the industry and the state-led creation of a new scientific-technical government agency.

34 The major decree of this later period was that of 27 January 1976 (*Ministère de l'Industrie et de la Recherche*) relating to CNES and the overall organization of space research.[34] This decree abrogated decrees 68-853 and 62-153 as well as those dispositions creating and modifying the *Comité des recherches spatiales/ Conseil de l'Espace*. The principal innovations of this text (within the context of science and technology in general having been taken under the wing of the 'Super Ministry' of Industry and Research) were firstly to concretize the important notion of 'applications' in space activities in terms of the establishment of a *'Conseil des applications spatiales'* within CNES, and secondly, to balance this with a *Comité des programmes scientifiques et techniques*. The members of the Science and Technology programmes committee were appointed by the Ministry of Industry and

Research to an advisory capacity to the CNES board of Administration. Their brief was to monitor the scientific and technical quality of existing CNES programmes and also to envisage new avenues of research and development for the space programmes given the current capacities of French science and industry. The *Conseil des applications spatiales* was instituted in an advisory capacity to the Industry and Research Minister. Of interministerial composition, it represented the eight Ministries having an interest in space sector activities (especially the practical applications of technology) namely Foreign Affairs, Economy and Finances, Defence, Industry and Research itself, Transport, Universities, Overseas departments and territories and the PTT Ministry. These representatives mainly of what were to become known loosely as the 'user Ministries' accompanied by eight scientific and technical experts appointed by the MIR assisted the three principal members of the Conseil, namely the *Délégué Général à la recherche scientifique et technique*, the President of CNES and the CNES *Commissaire du gouvernement*. The brief of the Council was to establish bi-annual reports and recommendations on the evolution of applications programmes and on the harmonization of research spending on them between the different user sectors.

35 The effects of a decree of August 1977 were essentially to translate the effects of a Ministerial reorganization of responsibilities for CNES into the legal texts controlling its institutional existence. In effect, the break-up of the 'Super Ministry' of Industry and Research brought CNES under the authority of the new Ministry of Industry, Commerce and Artisanat and also under that of the *Ministre Chargé de la Recherche*. The opportunity was also taken to fine-tune the composition and briefs of the Space applications Council,the representative of the Research Ministry being dropped from its roll. Décret 77-978 du 22 août 1977, Journal Officiel 23 August 1977, p.4392.

36 The distinction between 'autonomy' and 'autarky' is a nice one.

37 See, for example, Sillard, Y., and Bouillot, J.-C., 'Ariane, programme européen de lanceur lourd', Défense Nationale, March 1974, pp.129-139, and Denisse, J.-F., La Politique spatiale de la France', Défense Nationale, May 1973, pp.17-25.

38 Schwarz, M. European policies on space science and technology, 1960-1978, Research Policy No. 8, pp.204-243, p.222.

4. French and European space industries in the 1980s

As further essential context to the making of space policy, this chapter briefly presents European and French space industry in terms of its firms and the products which they manufacture. The chapter also looks at the markets which exist for French and European space companies. The period studied is essentially that of the 1980s (and early 1990s). The chapter will deal first with the structure of the European space industry at the European level, before presenting the four major French aerospace firms and their programmes. Finally it will look at the markets for space products and services. The chapter will show the importance of the French space sector in the European space industry as a whole, and give an indication of the 'economic weight' of the French space sector.

This treatment of the background industrial features of the space sector does not intend to give an exhaustive economic and financial analysis of the European space industry and the firms which compose it. Its ambition is rather to set the context industrially and commercially for the discussion of the' politics' of the French space sector which follows in subsequent chapters.

The plan of the chapter is as follows :

- **4.1.** Aerospace industry structure in France and Europe
- **4.2.** The major French space firms and their programmes
- **4.3.** Space markets and sales
- **4.4.** Conclusion

4.1. Aerospace industry structure in Europe and France

The European space sector is heavily concentrated. A relatively small number of firms more or less heavily specialised in space technologies make up the overall sector. In order to look at its structure, it is convenient to divide the firms making up the European space industry into three main groups according to the scale (large, medium or small) of their involvement in space activities. French firms are heavily represented in these groupings, with a preponderance of larger firms. The following tables show these three groupings and the 21 firms which constitute the bulk of the European space industry's activities.[1] This classification of the major firms excludes the French/European company Arianespace, which although one of

the crucial actors in the space industry represents in some ways more an 'interface' between space industry production and the market for space technology than a producer itself.

The following tables give an indication of the major European aerospace companies :

The major European firms (1991)

Firms with sales +200m ECU (1990)	Sales (ECUm)	% change 1989-91
Aérospatiale	605	+18.9
Dornier	573	+123.0
Matra (MMS France)	557	+56.9
SEP	411	+5.4
Alenia	317	+10.4
Alcatel Espace	257	+16.3
MBB	250	+20.2
Firms with sales 50m-200m ECU	**Sales (ECUm)**	**% change 1989-91**
British Aerospace	169	-13.4
Marconi (MMS UK)	140	+19.2
Thomson CSF	115	na
Dassault Aviation	108	+231
BPD Difesa & Spazio	85	+86.8
MAN Technologie	84	+25.4
ANT-Nachrichtentechnik	63	-6.7
Firms with sales 10m-50m ECU	**Sales (ECUm)**	**% change 1989-91**
Fokker	43	+0.7
CASA	34	+34
ETCA	30	+16.3
Sextant Avionique	26	+52.9
Saab Space	21	+23.5
Volvo	17	-15
Ericsson	10.6	-25.9

(Source The European Space Industry, Euroconsult 1992)

As can easily be seen from the tables, French companies figure prominently in the 'first division' of European space firms, and are well represented in the intermediate division of the major firms. The figures for sales illustrate how the space industry experienced a period of buoyancy during the late 1980s.

The structure of the European space industry has recently been changing, since starting in the late-1980s, there have been a number of European mergers and some attempts by European firms to buy into the American aerospace industry. In Germany, DASA was created out of the 1989 consolidation of Messerschmitt-Bolköw-Bloehm (MBB), Dornier and Telefunken System Technik. In Italy, the 1990 merger of Aeritalia and Selenia created Alenia. In France and Britain, Matra Marconi Space was constructed from the space divisions of Matra and GEC-Marconi. In Scandinavia, the 1992 merger of Saab Scania and Ericsson space activities created Saab Ericsson Space.

4.1.1. The French space industry - structure, programmes and employment

The French aerospace industry is composed of a small number of large firms and a much larger number of parts and equipment suppliers (*équipementiers*). The large firms are, with the exception of Arianespace, involved in high-tech aeronautics / aerospace and defence activities, as well as in space programmes. According to the Gifas literature on the French aerospace industry, the major firms can be listed as

Aérospatiale,
Air Liquide
Alcatel Espace,
Arianespace,
Dassault-Aviation,
Matra Marconi Space (MMS),
Société européenne de propulsion (SEP)
Société nationale des poudres (SNPE)
Thomson CSF.[2]

Within this first group of major firms, divisions can be made between Arianespace, which stands alone as the sole company concerned with the construction and commercial exploitation of launchers, Aérospatiale, Matra and SEP who function as *'maîtres d'oeuvre'*, or prime contractors for large programmes, Alcatel, Dassault and Thomson who specialise in electronics, and finally Air Liquide and SNPE who provide cryogenic gas, liquid and solid rocket propellants.

Around these major firms, the smaller component and equipment suppliers form a secondary level of industrial expertise, contributing to the programmes coordinated by the prime contractors. In comparison with the ten or so major

firms, the *équipementiers* number approximately fifty, representing a third of the total firms making up the membership of GIFAS.

The major programmes undertaken by the French space industry since the 1970s are presented in tabular form overleaf, in order to give some impression of the variety of technologies and projects which provide employment in the space sector.

The programmes can be divided into two main kinds: firstly those concerned with launchers and shuttles (what CNES refers to as *'le transport spatial'*), orbiting platforms and space station elements - 'orbital infrastructure'; and secondly, satellites of various natures.

The table overleaf lists the launcher and orbital infrastructure programmes.

Major Civil programmes : Launchers / Orbital infrastructure				
Programme	**Nature of programme**	**Operational use**	**Main companies**	**Remarks**
Ariane	Launchers. Increasing reliability and payload capacity provided by evolving 'family' of rockets.	1979 -	CNES, Aérospatiale, Matra, SEP, Air Liquide	Programme led by CNES as prime contractor for ESA. Ariane V to be operational 1996.
Columbus	Laboratory module for Freedom space station + polar platform	1999	Prime contractor = MBB-Erno	Programme led mainly by FRG. Cuts imposed by ESA in 1992. New review proposed for 1995.
Eureca	Recoverable platform	1993		In cooperation with ESA and Nasa
Hermès	Manned space craft. Unpowered shuttle servicing space station, launched by Ariane V.	2000 - 2004(?)	CNES, Aérospatiale, Dassault	Programme led by CNES as prime contractor for ESA. Initial programme agreed in 1985 and 1987. Funding withdrawn 1992, except for minor studies.

(Sources: various)

Overleaf we present the rather longer list of satellite applications programmes undertaken by France, either alone or in partnership.

Major Civil Applications programmes : satellites			
Programme	Objectives	Operational use	Remarks
Arabsat	Telecoms	1985 - / 1992 -	2 satellites for Arab League countries
Argos	Data localisation and collection	1978 - /1989 -	French system carried by US NOAA satellites
ECS-Eutelsat	Telephone and TV liaison	1983 - / 1984 - / 1987 - /1990 -	4 satellites ECS, 3 satellites Eutelsat
ERS	Marine observation	1991 -	ERS 1, ERS 2
Giotto	Astronomy	1985	Cooperation / ESA
Hipparcos	Astronomy	1989	Cooperation / ESA
Intelsat	International telecoms	1980 - / 1991 -	Series of telecom satellites
Marecs	Maritime telecoms	1982	
Meteosat	Space meteorology	1977 - / 1981 - / 1988 -	Geostationary weather satellite exploited by Eumetsat
Olympus	Technological satellite for telecoms	1989	Experimental direct broadcasting of educational programmes. Project financed by ESA.
Phobos	Probe for study of Mars	1988 - / 1989 -	Franco-Soviet cooperation
Sarsat- Cospas	Search and rescue	1985	Collaborative programme involving France, US, Canada, USSR.
Sigma	Radio astronomy	1988	Franco-Soviet cooperation
Spot	Earth observation	1986 -	Spot 1, 2, 3, 4.
TDF / TV-SAT	Direct satellite broadcasting	1988 - / 1990 -	Cooperation with FRG
Telecom	Telecoms	1984 - / 1985 - / 1988 - / 1991 - / 1992 -	National telecoms programme led by CNES for French PTT.
Topex-Poseidon	Oceanography	1992	In cooperation with US

(Source: various)

Overall, the work on these programmes conducted by small and large firms combined in the early 1990s is held to provide employment for some 9,000

individuals in *directly* space-related industry alone, to which an even greater number of indirectly related jobs must be added in order to reach an estimation of the total number of jobs provided in France by the space sector. The most favourable estimate puts total employment at 25,000, and slightly more conservative analyses conclude that the most valid figure is slightly in excess of 22,000. The OPECST 'Rapport Loridant' of December 1991 gave the following breakdown of employment for 1990 in the overall space sector :

Overall French space sector employment (1990)	
Space industry (strictly defined)	9,000
Induced industrial and service employment	5,000
CNES / ESA contracts (indirectly space related)	4,300
CNES, non-industrial subsidiaries, French staff members of ESA, scientific laboratories	4,000
Total	22,300

(Figures are based on CNES estimates and confirmed by EC statistics)

4.1.2. Space 'industry' or space 'sector' ?

There is some discussion about the use of the term 'sector' to describe the activities and nature of French space industry. CNES official literature and those involved in the French space effort talk easily about the space 'sector', but the use of the term in this way is both a convenient shorthand and something of a dangerous oversimplification of the real complexities of the space sector/industry. The economists François Chesnais and Claude Serfati have pointed out in a study of French military spending and technological competitivity that in a related activity, the terms 'arms industry' and 'military sector' are precisely no more than convenient labels, since arms activities are technically neither an independent *'branche'* of the economy, nor a 'sector', in the prevailing definitions of these concepts in France.[3] The same analysis also easily applies to the 'space sector', which presents very similar characteristics to those of the 'arms sector' which motivate Chesnais and Serfati's remarks, namely the mis-match between 'space activities' and the classes of industrial activity as defined by the French national accounting system, and the civil-military duality of space technologies and the firms which specialise in them.

Chesnais and Serfati also stress the difficulties of obtaining statistical information concerning the arms industry, in addition to the problems induced by the national accounting classifications. They quote both Edward Kolodziej and

French authors in emphasizing that the attitude of the French government over recent decades has made the search for quantitative information more problematic in France than in other countries.[4]

The French 'space industry' is similar to the 'defence industry' in the way the major industrial firms which constitute it undertake both 'space' and 'non-space' related business, just as defence industry production originates from companies which combine civil and military activities. In fact, the real, (as opposed to analytical) similarities between the French space and defence industries go even further, since many of the space industry firms are simultaneously involved in defence work, either specifically on military space programmes, or on other arms projects which share facilities, techniques or personnel.

In considering the 'structure' of the French 'space industry', and in discussing the major firms whose civil and military space activities go to make up the overall French space effort, it would seem wise to bear Chesnais and Serfati's concept of an arms industrial 'meso-system' in mind. In this analysis of the arms sector, borrowed from de Bandt's interpretation of the notion of *'filière'*, stress is placed on the commercial-financial and other interrelationships between the protagonists in the 'system'.[5] According to Chesnais and Serfati this kind of industrial structure favours the development of a closed system of relationships exclusively between members of the 'sector' and little exchange with the rest of the economy. Amongst other examples of such confined interchange in the arms meso-system, Chesnais and Serfati cite that of the 'aeronautics and space industry', in which a mere three groups employ 70% of the sector's personnel and account for 75% of sector turnover.[6]

4.2. The Major French space firms and their programmes

In this section we shall look at four of the major French space companies which make up the sector. Three of these are included in the tables above in the first rank of European space companies - these are Aérospatiale, Matra and Sep. The remaining company of the quartet, Arianespace, is not a giant of French high-tech industry like the others, but is nevertheless the single company which has become a symbol of the French and European space effort, through its management of the European satellite launcher Ariane.

4.2.1. Arianespace

Arianespace is a CNES subsidiary, incorporated in March 1980 as a French limited company owned by CNES, thirteen major banks and most of the major European aerospace companies.[7] It manages the production, marketing and launch of Ariane rockets and their services.

Arianespace is nominally an European company, by virtue of the wide range of European companies who are shareholders. However, the majority of shares are held by the French national space agency, CNES, and by a number of French space companies. Total French participation in Arianespace was consistently approximately 60% during the 1980s. In addition, the company was incorporated under French law. The table below gives the national breakdown of Arianespace shareholders in the initial period of the company's existence from 1980 to 1990:

Arianespace shareholder structure 1980 - 1990

	B	DK	E	F	GB	Irl	It	PB	D	S	CH
Total national % share of capital (1980)	4.4	0.7	2.5	59.2	2.4	0.25	3.6	2.2	19.6	2.4	2.7

(Source : Arianespace)

As the table shows, the French interest in the European company is almost three times as great as the next national holding, predictably that of Germany. Even more significantly, in terms of the real nature of the company, a full 34% of shares were initially held by CNES alone. Of the industrial shareholders, the French companies SEP and Aérospatiale each took 8.5% each, and MAN of West Germany 7.9%. Five French banks together account for 2% of the shares.[8]

The nature of Arianespace's activities is confusing to the extent that it is concerned with funding and managing the production of the rockets and with selling and organising their launch, but was not involved in the early development of the launcher programmes during the 1970s. Arianespace's operations are thus 'commercial' in that they present a finished space product to the market (satellite owners needing launch facilities), where a customer-client deal is struck for the launch and launch price. Critics of this system point out that the Arianespace company is not a truly commercial enterprise since it has not funded the development of the launchers itself, but only pays for the use and maintenance of the European Space Agency (ESA) Kourou launch facility in French Guyana. The

ESA is in fact the legal owner of the Ariane launcher, which was developed under ELDO/ESA supervision between 1973 and December 1979, when the first launch was successfully made. Even after the setting up of Arianespace in 1980 and the signing of a cooperation agreement between the new company and the European agency, the ESA was still in charge of the five test launches which proved that the launcher was reliable technology, before Arianespace took over for the world's first 'commercial' launch on 26 March 1984.[9]

Since the early 1980s, Arianespace has continued to develop the Ariane launcher, creating a 'family' of rockets of ever increasing payload, size and reliability. The latest in the series are the fully operational Ariane 4 and the yet-to-be completed Ariane 5, whose entry into commerical service is planned for the summer or autumn of 1996. In 1989, Arianespace negotiated the so-called P9 framework agreement with the major industrial companies involved in producing the Ariane 4 launcher for the supply of a series of 50 such rockets to be delivered between 1992 and 2000. Production of this series of launchers was estimated at 18 billion francs for French industry, which is the most heavily involved in Ariane programmes.

In 1990, the composition of Arianespace was changed in order to reflect the new industrial directions in which the launcher sector was moving, namely the production of Ariane IV and Ariane V, with different mixes of companies from the early days of 1980 and the first launchers. The modification to the set up of the company also gave more flexibility, by creating a financial holding company (Arianespace participation) alongside the original operating company (Arianespace SA). The original participations in the capital had reflected the extent to which the individual companies had expected to be involved in the programmes. Between 1980 and 1989, when the decision was taken to modify the structure of the company, not only did the value of the company quadruple, but the collaboration of the initial companies also evolved as a function of the development of the programmes. The greater involvement of the Italian firms SNIA BPD and Fiat Aviazione in particular was recognised by the redrawing of ownership, since overall Italian ownership was increased from 3.6% to 7.12%. The overall French stake in the company was reduced by 2.6%, (despite the entry of SNPE), with the CNES participation falling from 34% to 32.34%.

The table overleaf gives the full Arianespace shareholder structure after the 1990 reorganisation :

Arianespace shareholder structure after 1990 reorganisation											
	B	DK	E	F	GB	Irl	It	PB	D	S	CH
Total national % share of capital (1990)	4.33	0.67	2.38	56.6	3.02	0.24	7.12	2.09	18.6	2.28	2.57

(Source: Arianespace)

Arianespace is of conceptual importance in an understanding of the French and European space effort for the ways in which it embodies the twin concerns of the promoters of such high-tech industry, namely the concern to acquire prestige and autonomy through the ability to do what few others can, and also the desire to attempt to make such technology economically profitable, or at the least to obtain some return on development costs. The origins of the Ariane programme are to be found in the French desire for a European launcher capability independent from the US. During the 1960s and the early 1970s, France developed contributions to an early version of a European launcher in parallel with the development of the national *Diamant* series of rockets. After the difficulties of the ELDO as an organisation and the unsatisfactory technological solutions of the first European collaborative rocket project, France was at the forefront of a move to 'Europeanise' one of her launcher programmes within the framework of the merger of ELDO and ESRO into the ESA. The desire to try to make such costly initiatives pay in some way is represented by the desire to 'commercialise' the services provided by Ariane - making the market rather than the taxpayer fund the use of the launcher, even if the taxpayer, through the state had already contributed 1bn dollars to the R&D of the facility before handing it over to Arianespace.

Arianespace was created because of lobbying from France to the effect that an international governmental agency such as the ESA was ill-suited to the dynamic management and promotion of a product and services such as those represented by Ariane. The original objective of Arianespace was to obtain 30% of the world launch market during 1985-1991. Partly because of the problems encountered by the American Space shuttle and partly because of the dynamism of Arianespace and the relative reliability of the launcher, the company has managed to obtain an average 50% of the satellite launch market in competition with US commercial launchers such as Thor Delta and Atlas.

The following table illustrates how Arianespace succeeded in steadily raising its total sales and earnings in the period 1984-1992 :

Arianespace : financial and launch statistics 1984-1992									
	1984	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**
Total sales (million F)	725	1409	1289	940	3672	3794	3979	6028	5000
Net earnings (million F)	5	22	209	303	127	135	130	154	150
No. of satellites launched[1]	6 (9)[2]	7 (16)	4 (20)	3 (23)	12 (35)	10 (45)	9 (54)	11 (65)	11 (76)
Orders (billion F)	7.0	8.2	13.3	14.1	14.0	14.5	15.4	-	-

1 - figure in brackets = cumulative total
2 - cumulative total includes satellites pre-1984
(Source: Arianespace Newsletter and CNES Annual Reports)

What Arianespace defines as the 'commercial market' is a relatively circumscribed sector, amounting in general to not more than an average of twenty satellites to be launched per annum. Between 1984 and 1992, Arianespace concluded 101 contracts with satellite owners and launched 75 satellites using 50 launchers. Arianespace's 1992 market forecast put the annual short term commercial market at 21-22 satellites, the medium term market at 18-21, and the long term at 16-18. Despite the small numbers of launchers and satellites involved, Arianespace officials resolutely present their company's activities as being a 'non-negligable source of revenue', stressing the forecast that between 1984 and 2000, Arianespace will have accrued revenues to France of the order of 70 bn francs.[10]

The economists and space analysts Cohendet and Lebeau have pointed out that the 'commercialisation' of a launcher such as Ariane only represents an *additional* justification for a project whose real objectives are other than purely economic.[11] These real objectives concern the place of France and Europe within the international space community, specifically vis-à-vis the United States. French support for a European launcher whose development, production and commercialisation are dominated by CNES and French industry has reflected a strategy of ensuring an important degree of relative autonomy for the European space industry and space users from US launcher monopoly, at the same time as guaranteeing the creation and maintenance of technical expertise in France. The table overleaf gives an indication of how the company has developed its product and services, through different launchers, since the first operational flight in 1982 :

Ariane Launches 1982-1992			
Flight	Date	Launcher	Satellite(s)
V5	Sept. 82	A1	failed
V6	June 83	A1	*ECS 1* and Amsat P-3B
V7	Oct. 83	A1	Intelsat VF7
V8	March 84	A1	Intelsat V
V9	May 84	A1	Spacenet F1
V10	August 84	AR3	*ECS* and *Telecom 1A*
V11	Nov. 84	AR3	Spacenet F2 and Marecs B2
V12	Feb. 85	AR3	Arabsat A and Brasilsat 1
V13	May 85	AR3	GStar 1 and *Telecom 1B*
V14	July 85	AR2	*Giotto*
V15	Sept 85	AR3	Failure - *ECS-2* and G-Star 2
V16	Feb 85	AR2	*Spot 1*
V17	March 85	AR3	GStar 2 and Brasilsat S2
V18	May 86	AR2	Failure - Intelsat VF14
V19	Sept. 87	AR3	*ECS 4* and Aussat K3
V20	Nov. 87	AR2	*TV-Sat 1*
V21	March 88	AR3	*Telecom 1C* and Spacenet 3R
V22	May 88	AR2	Intelsat VF3
V23	June 88	AR4	*Meteosat P2* and Pan Am Sat F1
V24	July 88	AR3	Insat 1C and *ECS 5*
V25	Sept. 88	AR3	SBS and G Star 3
V26	Oct. 88	AR2	*TDF 1*
V27	Dec. 88	AR4	*SLS Astra and Skynet 4A*
V28	Jan. 89	AR2	Intelsat VF15
V29	March 89	AR44LP	MOP 1 and JCSat 1
V30	April 89	AR2	Tele-X
V31	June 89	AR44L	DFS-1 and Superbird A
V32	July 89	AR3	*Olympus 1*
V33	Aug. 89	AR44LP	*TV-Sat 2* and *Hipparcos*
V34	Oct. 89	AR44LP	Intelsat VI
V35	Jan. 90	AR40	*Spot 2*
V36	Feb. 90	AR44L	Failure - Superbird and BS-2X
V37	July 90	AR44L	*TDF 2* and *DFS 2 Kopernikus*
V38	Aug. 90	AR44LP	*Skynet 4C* and *Eutelsat II F1*
V39	Oct. 90	AR44L	SBS 6 and Galaxy VI
V40	Nov. 90	AR42P	Satcom C1 and G-Star IV
V41	Jan. 91	AR44L	Italsat 1 and *Eutelsat II F2*
V42	March 91	AR44LP	*Astra 1B* and MOP 2
V43	April 91	AR44LP	Anik E2
V44	July 91	AR40	*ERS-1*
V45	August 91	AR44L	Intelsat VI F5
V46	Sept. 91	AR44P	Anik E1
V47	Oct. 91	AR44L	Intelsat VI F1
V48	Dec. 91	AR44L	*Telecom 2A* and Inmarsat II F2
V49	Feb. 92	AR44L	Superbird B1 and Arabsat 1C
V50	April 92	AR44L	*Telecom 2B* and Inmarsat 2F4
V51	July 92	AR44L	Insat 2A and Eutelsat II F4
V52	Aug. 92	AR42P	Topex/Poseidon
V53	Sept. 92	AR44LP	*Hispasat 1A* and Satcom IIIC
V54	Oct. 92	AR42P	Galaxy VII
V55	Dec. 92	AR42P	Superbird A1
Total satellites launched with success = 76			

(Compiled from Arianespace Newsletter and CNES Annual Reports)[12]

4.2.2. Aérospatiale.

The *Société nationale industrielle aérospatiale* (SNIAS), better known as Aérospatiale, is a public corporation formed in 1971 by the nationalization of *Sud* and *Nord Aviation*, and the *Société d'études et de réalisations balistiques* (SEREB) which was founded in 1959 to manage the development of the early missile launchers for the deterrent force. SEREB was added to an essentially aeronautical merger to give the nucleus of what later became the Ballistic and space systems division responsible for the production of French strategic missiles, Ariane launchers, satellite 'buses' and a variety of space system components. Overall, space and strategic systems activities employ approximately 6000, 2000 of whom in 1988 were exclusively concerned by the space business of the firm.[13]

As a *Société nationale industrielle*, Aérospatiale has a specific legal status and specific rules governing its organisation and functioning, particularly in terms of the theoretical inspection of the company by government and the nomination of the *président directeur général* by the Council of Ministers. Since the mid-1980s the political instructions given to the firms of the public sector have been to make profits and to conduct their affairs in general in such a way as to provide as efficient management as possible.[14]

During the 1980s and 1990s Aérospatiale has still been heavily involved in the development and production and maintenance of deterrent launchers such the S3, the M4-M20,the M45 and the cancelled S45 for the military space sector, and in the development and production of Ariane and a variety of orbital infrastructures in the civil sector. Before the financial difficulties encountered by the Hermès space plane, Aérospatiale was also leading its development programme.

Aérospatiale is Europe's third largest aerospace group behind Deutsche Aerospace and British Aerospace. Since its creation it has grown constantly in tune with increasing demand for civil and military equipment and services. The provision of strategic missiles for the defence ministry has represented a steady source of income and employment for the group, as has its participation in the Airbus projects. Space products have gradually increased in importance both within the space/defence division of the company, and in terms of their contribution to overall turnover. It is often difficult to distinguish between the space and defence activities of the space and strategic systems division because for obvious reasons of discretion, the company does not readily disclose separate figures. This lack of information at the level of firms is mirrored (and encouraged ?) by the absence of distinction between civil and military space products in national

accounting statistics.[15] However, the figures that can be found for Aérospatiale show a decline in the relative importance of 'defence/strategic systems' within the division and a increase in the space activities, both civil and military, as the table below illustrates :

Space and strategic defence systems activities 1979-1991

Orders	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
SBS/SSS (m F)	2.54	2.60	2.84	3.60	3.40	4.1	4.1	4.4	4.77	5.46	7.19	8.02	8.49	7.7
SNIAS (m F)	11.0	13.2	16.5	21.4	22.7	24.0	24.5	25.4	24.9	28.0	31.7	32.8	38.0	39
SBS/SSS % SNIAS	23.0	19.7	17.2	16.8	15.0	17.0	16.7	17.3	19.1	19.5	22.7	24.4	22.3	19.7
Space systems % SNIAS						4.2	5.0	5.1	6.8	8.2	11.8	13.1	13.4	9.9

(Source : Aérospatiale Annual reports, Euroconsult, La Lettre du CNES, Air et Cosmos)

In 1979, Aérospatiale's space activities were undertaken by the *Division des systèmes balistiques et spatiaux* (DSBS), located in Les Mureaux, Bordeaux and Cannes, employing 6,000 people in total, and about 1,000 specifically on space. DSBS total turnover in 1979 was 2 543 million francs, representing 23% of the total turnover of SNIAS (11 000 million F)[16] A decade later in 1989, the renamed *Division des systèmes stratégiques et spatiaux* (DSSS) accumulated sales of 7 186 million francs (almost a three-fold increase), again representing almost 23% of Aérospatiale's total turnover of 31 671 million francs. However, *space* by 1990 was employing a greatly increased workforce of 2,000, and its contribution to the overall turnover of the group had risen from 4.2% in 1984 to 13.1%.

In 1989, the turnover of the DSSS became predominantly civil-oriented for the first time a year after the entire group's activities had similarly moved from a 47% civil share of overall turnover to 51%. This long term evolution of the group's activities from military production to civilian projects was accelerated during the 1980s by the weakening arms market and by the slow but real increase in civil

programmes such as Airbus and space. In more detail, in 1989 and 1990, the total turnover of the DSSS gave the following breakdown by sphere of activity :

DSSS : % turnover by activity				
	1989	1990	1991	1992
Military	48	46	40	50
Launchers/ Hermès	29	33	60	50
Satellites	21	19		
Misc. Civil	2	2		
Total	100	100	100	100

(Source : Euroconsult, Air et Cosmos)

In 1991 the decline in the proportion of purely IRBM activities within the division continued in step with the long term reduction in demand for such systems, although 1992 saw a temporary rebalancing of the civil and military sides of the division's activities before a projected move towards a 30 : 70 military-civil split in 1994.[17] Such a decline in the military ballistic activities of the group is of concern for the group itself and for the French government, who despite the falling demand for modernised missile systems are still interested to maintain technical and industrial skills in Aérospatiale. An example of the state's desire to see the *société nationale* protecting the industrial and technical base of the nation was revealed by the head of the DSSS, Michel Delaye, who stated in an interview with Air et Cosmos in February 1992 that the group was discussing with the Defence ministry the best way of safeguarding skills and expertise within the division, possibly by bringing forward the M5 and S5 missiles in compensation for the shelved S45.[18] The full range of Aérospatiale's involvement in space and IRBM systems is presented in tabular form below :

Aérospatiale programmes		
	Launch vehicles	Satellites
National programmes	Sounding rockets, *Pierres précieuses* launchers : *Diamant A*, *Diamant B*, B - P4.	FR1, D1-C/D1-D, Péole, Eole, D2-A, D2-B, D5-A, D5-B, Starlette, Telecom 1, Spot.
International programmes	Europa 2, Europa 3, Ariane, Hermès.	Symphonie, COS-B, Météosat, I.U.E., Intelsat V, Exosat, Spacebus, Marecs, TV Sat/TDF-1, Telecom 2, Arabsat, Eutelsat 2, Turksat, ISO.
Military programmes	MSBS: M4, M20, M45. SSBS: S3, S45.	Hélios

(Source : Prospace)

4.2.3. Matra

Matra was initially a private limited company founded in 1945 as the Société Mécanique-Aviation-Traction, nationalised in 1982 and reprivatised in 1988. During most of the 1980s Matra was a diversified group whose various divisions specialised individually in transport systems (such as automatic tram and metro lines) automobile design (the car/van Espace in conjunction with Renault), military electronics, and missile and satellite construction. The firm employed up to 1600 people on communications, Earth observation and space science satellites. Since 1989 Matra's space activities have been undertaken in conjunction with Marconi under the umbrella of the joint subsidiary Matra-Marconi Space. More specifically, in terms of its applications programme involvement, Matra is prime contractor for a number of current satellite programmes such as the Spot earth observation satellites and the Hélios military observation satellite programme. Matra also collaborates with British Aerospace on satellite manufacture, both through the integration of BAe Space systems' components in Matra satellites (e.g. antenna reflector assemblies for Telecom 2 satellites) and through provision of components for BAe.

Matra was nationalised by the new Socialist administration in 1982, not as part of the 1981 nationalisation law but as an individual company (along with others), which the new government felt should be under state control because of the nature of their activities. Thus the steel companies Usinor and Sacilor were nationalised, as was Roussel-Uclaf (chemicals), the electronics and computing firms ITT France and CII-Honeywell Bull, and, as a companion for Matra, the flagship high-tech defence/aerospace firm Dassault-Bréguet. The nationalisation took the form of a 51% holding by the state rather than the outright 100% acquisition imposed on other nationalised companies. This was because total ownership of the whole Matra group was seen as wasteful of resources, given that the element of Matra which was specifically intended for state control was the defence division. However, because splitting the arms/defence branch from the rest of the group was deemed impracticable, without jeopardising the survival of the closely linked civil and military activities, the whole group was acquired on the basis of the 51% controlling interest.

Ideological justifications for the increase of state influence in the economy through these nationalisations were two-fold and often complementary, being based on the desire of the new socialist administration to control monopoly capitalism and to use nationalised industry as a means of modernising and

restructuring the industrial fabric in order to assure the future performance of the economy. In the nationalisation of the aerospace/defence firms Dassault-Bréguet and Matra (Engins Matra) the Left combined industrial and moral justifications by controlling an important, but in their eyes essentially shameful trade in high-tech weapons of destruction. (One should remember President Mitterrand's visit to an Arms trade fair in 1981, when he ordered bombs and other equipment to be hidden from television cameras filming his progress). The nationalisations created a vast public sector in France, and underlined the importance of the state in the development of the French economy in general and in high-tech industry in particular.[19]

Matra's overall turnover in 1980, prior to nationalisation was 3.7 billion francs, about 50% of which was derived from its defence-based activities in missile systems and military electronics. In 1981, the Space division of Matra employed 1,000 people and had a turnover of just over 700 million francs. The then space division chairman Noël Mignot made the point that the space activities of Matra had an importance within the group as a whole disproportionate to the (relatively small) number of employees involved or the turnover of the division.[20] The justification for this claim was that the space division acted as a quality catalyst for the rest of the group, both in terms of the dissemination of high-tech expertise and in the training of expert upper management personnel[21] This is an argument which is used within the space sector as a whole in favour of maintaining and increasing levels of funding, usually claiming that that the space sector acts as a school of quality within industry as a whole through its rigorous requirements for reliability, lightness and strength. A second aspect of the general argument is that the pluridisciplinarity of space techniques allows them to play a coordinating and catalysing rôle both within industrial groups such as Matra and in the overall industrial fabric.[22]

In 1988, during the Cohabitation period, Matra was re-privatised by the neo-liberally inspired government of Prime minister Jacques Chirac and Finance minister Edouard Balladur as part of a programme of 'de-nationalisation' intended to undo the effects of the Socialist nationalisations of 1981. This denationalisation programme was only partial and was effected in conditions which have since led to considerable debate over the management of the *'offre publique de vente'* (OPV).[23] Despite the unsettling circumstances of its (political) re-privatisation, since 1988, Matra has flourished, and has pursued tactics of continued diversification and of alliance seeking outside France. For Matra's chairman, Jean-Luc Lagardère, these tactics are part of a strategy of risk minimisation aimed at insulating Matra from the vagaries of recession in particular sectors of the

company's activity. The different activities of the different divisions are not directly related, except for their common reliance on the use of high-tech. The four main activities are roughly equal in their contributions to the total turnover of the firm, except for a slight predominance of the automobile/transport branch.

The divisions of the Matra group are Matra Défense, Matra Marconi Espace, Matra Communication and Matra Automobile. The contributions of these different commercial activities to the group's overall turnover in 1990 was as follows:

Matra - Balance of activities 1990	
	% of turnover
Defence	24 (1979 = 50)
Space	20
Telecom/IT	23
Auto/transports	33
Total	100

(Sources : various)

The diversification and expansion of the group since 1988 has seen the separation of the two elements of Matra Défense-Espace and a move towards a more equal balance between the military and civil turnover of these closely linked activities. Matra has also made acquisitions in the United States, the most important of which was the Fairchild Defence and Space Corporation whose activies are highly similar to those of the Defence and Space divisions of the group.

Matra's involvement in the space industry has increased since its privatisation through association with GEC Marconi and Daimler-Benz in Matra Marconi Space (MMS). Matra Marconi Space was created initially in December 1989 with a retroactive clause considering that the fusion was valid from July 1989 by the partnership of the two subsidiarized space divisions of Matra, and GEC early in 1990 MMS was joined by Daimler-Benz, the British and German companies already having each acquired 4.9% stakes in Matra itself on its 1988 privatisation. The grouping thus created is considered to be Europe's biggest satellite payload and ground systems expert, with know-how ranging from design and production of satellite platform (bus) and payloads through navigation systems, antennae, launcher components and ground stations.

MMS has a turnover of some 3 billion Francs and employs approximately 2,700. It is incorporated under Dutch law. As the joint subsidiary of Matra and GEC, MMS brings together the space related activities of the two firms, with the exception of those of Matra's wholly-owned American subsidiary Fairchild Space and Defense. MMS as created before the fusion of the Daimler-Benz subsidiary Deutsche Aerospace was a joint subsidiary, in which however Matra has the

controlling interest of 51% as opposed to 49% for GEC. The retention of a controlling interest is a typical feature of Matra's strategy of Europeanisation of its activities - characteristic both of the tight hold that Matra's Managing director for the last 25 years maintains over the running of the group and of the desire for French controlling interests in 'European' groupings. Jean-Luc Lagardère has declared the general principle that mergers and fusions will always guarantee Matra's own autonomy.[24]

Space activities in the Matra group

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Turnover (* = MMS)	382	702	928	1090	1250	1500	1837	1676	1903	2600	3000	4500 *	?
% growth of turnover	25	83	32	17	15	20	22	- 9	14	31	15	150	?
space as % of total	12.8	15.6	16.5	17.8	22	25	30.8	25.5	27.1	25	20	100	?
space employed	640	800	950	1124	1200	1206	1289	1330	1376	1620	1570	2700	?

(Source Matra)

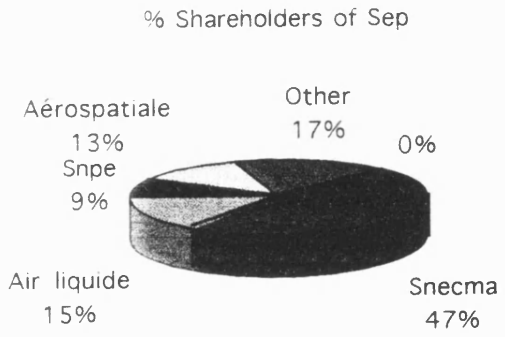
4.2.4. The *Société Européenne de Propulsion*

The interestingly named *Société européenne de propulsion* (or SEP) is actually a French publicly owned company involved in the production of equipment for the deterrent force and the civil space industry. SEP's principal activities are the development and production of rocket motors for missiles and satellite launchers, especially Ariane. In 1988 SEP employed some 4,100 people overall, of which 2,000 were exclusively involved in the strictly 'space' aspects of the company's activities. In terms of employment, although the 1980s and early 1990s have been a period of industrial and financial expansion for SEP, cost-cutting and rationalisation has led to a gradual slimming down of personnel to an expected level for end-1993 of 3,650.[25]

In more detail, SEP's activities are based around the two major organisational divisions of its industrial facilities, namely the liquid propellant and space division and the solid propulsion and composites division. SEP deals in storable liquid propellant UDMH and N_2O_4 for the first and second stages of Ariane IV, and cryogenic liquid oxygen and hydrogen propellants for the third stage of Ariane IV and for the main stage of Ariane V. The solid propulsion and composite materials division produces solid propulsion Ariane V boosters and satellite apogee motors in addition to thermal protection techniques for Hermès.

Within the context of the *Groupe petite propulsion et équipements* SEP also provides ground station facilities for the control of satellites such as Spot and Landsat and the interpretation of their data.

SEP was created in 1969 by the merger of the state aeronautics company SNECMA's *'division missile-espace'* and the company SEPR, specialised in jet propulsion technology. In 1971, this developing centre of propulsion expertise was strengthened by the transfer to it of the industrial facilities of the state funded Saint-Louis *Laboratoire de recherches balistiques et aérodynamiques* (LRBA), which had provided the origins of French expertise in ballistic and space science in 1945. SEP is therefore a state-sector company owned principally by a *société nationale* involved in the research and development of aeronautical equipment (*'études et constructions aéronautiques'*). In 1988, the ownership of SEP was as follows :



(Source : Euroconsult)

Although SEP was initially heavily involved in the development and production of the propulsion systems for the early nuclear deterrent IRBMs, since the mid-1980s the balance of the company's activities has swayed towards civil space, as a consequence both of the rise in orders from the extension of the Ariane programmes and the initiation of Hermès, and of the slackening in demand from the military sector for new or updated ballistic missile systems. The following table shows the evolution of the civil-military balance during the mid-1980s :

SEP Civil space activities

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Space turnover as % of total	38.0	45.4	53.8	55.5	56.3	60.5	65.4	78.1	70.5	?

(Source : Euroconsult and European Space Directory 1993)

Like other state-owned companies in the aerospace sector, SEP has attempted to render its management of certain activities more flexible through the creation of *groupements d'intérêt économique*. To-date, SEP is involved in three GIEs, namely the *Groupement pour la grosse propulsion à poudre* (G2P), GIE Hyperspace, and GIE Europropulsion. By their nature, GIEs represent the joint action of two or more firms attempting to rationalise their activities through a fusion of existing structures or trying to create new collaborative ventures.

G2P was created by SEP and the Société nationale des poudres et explosifs (SNPE) in order to merge their solid propellant activities, within which they were already collaborating in the development of Ariane solid boosters. The Europropulsion GIE is also concerned with the development of solid booster propulsion, although as an equal partnership between SEP and SNIA-BPD working on Ariane V. GIE Hyperspace represents the somehow surprising initiative of SNECMA (the major shareholder in SEP) and SEP itself collaborating within the structure of a GIE on the preparation of hypersonic propulsion techniques. As well as the GIEs, SEP has initiated a joint subsidiary venture with Matra through the creation of the company MS2I to merge the optical sensing expertise of the two companies. Created in 1989 and employing approximately 400, the first year of activity of MS2I, (which is owned 65% by Matra and 35% by SEP) brought a turnover of 375 million francs.

Space turnover of SEP (by divisions and total)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Powder/ missiles	569	600	657	763	820	802	936	1022	1115	-	-	-	
Liquid/ Ariane	351	369	348	429	761	1156	1407	1640	2150	-	-	-	-
Satellite motors, materials, image treatment	54	92	207	202	227	305	287	358	379	-	-	-	-
Total	974	1061	1212	1394	1808	2263	2630	3320	3644	4447	4600	4536	4355

(Source : Euroconsult, La Lettre du CNES, various)

According to Euroconsult, SEP's profitability during the 1980s was good: in 1988 net profits were 77.2 million francs, representing an increase of 60% over the figures for 1987.[26] In 1990, the net profits were 140 million francs, again representing strong growth over the 1989 figure of 104 million.[27]

Below, SEP's activities are summarised in tabular form :

SEP activities : Programmes		
	Launchers	**Satellites**
European programmes	Viking motors for Ariane first and second stages, HM7 motor for third stage. Cryogenic HM60/Vulcain motor for Ariane V + solid propellant boosters.	Integration of propulsion sytem to ERS 1.
National/ Bilateral prorgammes		Spot propulsion, attitude control, solar array systems, ground receiving station and data treatment station. TDF1 /TVSAT electronic control of propulsion system. Telecom 2 fuel reservoirs.
Other/export		Eutelsat solar panel deployment systems. Hispasat fuel reservoirs. Various ground stations and data treatment stations for CNES, Sweden, Brazil, Bangladesh, Pakistan, India.
Military	S4 and M5 ballistic missile propulsion for the deterrent force. Hadès tactical missiles	

(Sources : various)

4.3. Space markets and sales

Having now examined the activities and performance of the major French firms which make up the French space industry and which contribute heavily towards the European space sector in general, it is now useful to look at the overall European space business in terms of markets and sales. The table below presents the major statistical measures of the EC aerospace industry during the 1980s, and overleaf we look at space as an aerospace product group :

The Aerospace Industry : Main indicators 1982-1992											
(m ECU)	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**
EC Sales	24835	25425	25425	28653	31663	32382	35224	44544	47706	46902	40533
Net Exports	1709	1027	2053	2081	583	510	289	- 376	-1380	-1788	3010
Production	26544	26737	27478	30734	32246	32892	35513	44168	46326	45114	43543
Employees (,000)	423	402	392	393	398	405	399	413	422	414	390

(Source: Panorama of EC industry 1994/DEBA)

4.3.1. Space as an Aerospace product group

EC aerospace production is divided into four product groups or segments, namely (in decreasing order of total turnover) aircraft, equipment, engines, and space. Although space systems production is the smallest of the four segments of the industry, it has been the segment which has shown the most consistent growth throughout the 1980s (16.6%).

Through examining the aerospace industry's turnover by product groups during the 1980s we can see the progression of the space segment, and contrast it with the evolution of the other product groups. The table below shows the trends in turnover for the four product groups, and divides them conveniently into military and civil components. From the figures it can be seen that the annual increase in turnover of the space segment 1980-88 was 16.6%, appreciably higher than the increases for the other segments (Equipment 13.5%, Aircraft 9.8%, Engines 8.5%). In addition, the Space and Equipment segments of the industry have increased their share of overall industry turnover at the expense of aircraft and engine production (Space: +1.5%, Equipment : +5%, Aircraft: -3.5%, Engines: -3%).

Turnover by product groups 1980-1988 (Civil and Military)

	1980 Million ECU			1988 Million ECU			1980-1988 Annual increase		
	Civil	**Mil**	**Total**	**Civil**	**Mil**	**Total**	**Civil**	**Mil**	**Total**
Aircraft	2826	8215	11041	7647	15663	23310	13.3	8.4	9.8
Space segment	574	69	643	2120	71	2191	17.7	0.4	16.6
Engines	1469	2529	3998	2898	4753	7651	8.9	8.2	8.5
Equipment	1246	3465	4711	3457	9489	12946	13.6	13.4	13.5
Interim	2123	4134	6257	5180	8507	13687	11.8	9.4	10.3
Total consolidated, including	6115	10144	14136	10942	21469	32411	13.4	9.8	10.9
Aircraft	1848	6512	8360	4914	12525	17439	13.0	8.5	9.6
Space segment	416	51	467	1355	63	1418	15.9	2.7	14.9
	%	**total**	**t'over**	**%**	**total**	**t'over**	**%**	**total**	**t'over**
Aircraft	13.8	40.3	54.1	16.6	34.0	50.6	2.8	-6.3	-3.5
Space segment	2.9	0.3	3.2	4.6	0.1	4.7	1.7	-0.2	1.5
Engines	7.2	12.4	19.6	6.3	10.3	16.6	-0.9	-2.1	-3.0
Equipment	6.1	17.0	23.1	7.5	20.6	28.1	1.4	3.6	5.0
Total, non-consolidated	30.0	70.0	100	35.0	65.0	100	5.0	-5.0	0

(Source: adapted from European Space Directory 1990)

The more rapid growth of the space segment during the 1980s must not however obscure the fact that it is the smallest of the four production segments, representing 4.7% of total industry turnover in 1988, in comparison with Aircraft (50.6%), Equipment (28.1%) and Engines (16.6%). The issue of rate of growth of the segment is nevertheless of interest when one considers that the increase in space activities 1988/89 was of the order of 31.9%, in comparison with declining aircraft and equipment production and solid growth in the engine segment. This increase in space systems production raised the proportion of space in total industry turnover from 4.7% (1988) to 6.2% for 1989. In 1990, European space production reached 3521 ecus, representing a much more modest increase of some 3.6% over 1989.

The table below illustrates the extremely rapid growth of the space segment in 1988/89 and the relatively less satisfactory performances of the other product groups over the same period. At + 42.4%, growth in the total turnover of the space segment was more than twice that of the engines segment and eight times more than the equipment and aircraft product groups. From the table it can also be calculated that total turnover of the space systems segment increased over the period 1980-1989 by some 485%.

Turnover according to Product groups				
(Million ECU)	1980	1989	1988/89	1990
Aircraft construction	11041	24456	4.9	26301
Space segment	643	3120	42.4	3521
Engines segment	3998	9108	19.0	10133
Equipment segment	4711	13637	5.3	14701
Total non-consolidated	20393	50321	9.2	–
Interim deliveries	6257	14204	3.8	–
Total consolidated, including :	14136	36177	11.6	–
Aircraft construction	8360	N/A	N/A	–
Space segment	467	N/A	N/A	–
Share in total turnover %				
Aircraft construction	54.1	48.6	- 4.0	–
Space segment	3.2	6.2	31.9	–
Engines segment	19.6	18.1	9.0	–
Equipment segment	23.1	27.1	- 3.6	–
Total non-consolidated	100	100		–

(Source : adapted from European Space Directory 1990)

If one considers the aerospace industry from the perspective of exports, the performance of the space segment during the period 1988/89 is again very strong - + 224% - although starting from a very low base figure and although they represent only 0.3% of total exports. The following table places space exports in the context of other market segments' exports and overall turnover :

Turnover according to Market segments			
Million ECU	1980	1988	1989/88 % change
Public authority R&D contracts	2038	4256	18.2
Modifications, repairs, maintenance	1055	2564	10.9
Sales in the EC	5362	12015	6.4
Exports extra EC	5681	17282	18.7
including :			
Aircraft construction	3720	9889	9.7
Space	82	590	224.2
Engines	1134	4127	24.5
Equipment	745	2675	16.7
Total turnover consolidated	14136	36117	13.7

(Source : adapted from European Space Directory 1990)

In order to contextualise these figures, it is again useful to compare them with the performance of the United States' space industry.

4.3.2. US and EC space markets compared

The Panorama of EC Industry 1992 points out that in contrast to the USA, where spending on space in 1989 approached eleven times European funding levels, EC space is predominately civil and is thus disadvantaged in comparisons with the US by huge DOD space funding. It is interesting to note, as the Panorama emphasizes, that in 1987, whereas US military space funding represented eight times total EC space turnover, US civil space spending was only twice that of the European Community countries. Comparisons between the US and European space efforts have recently also been made by the Commission of the European Communities. These comparisons conclude on the existence of a 'very significant structural disadvantage' suffered by the European space industry which affects its commercial competitiveness.

The following table illustrates the differences between the US and EC space industries identified by the European Commission, highlighting particularly the considerably greater involvement of government in markets (US = 95%, EC = 70%), the bias in favour of military markets in the US as a proportion of total government orders (53%) and the emphasis on civilian markets in the EC (60%), and finally the six-fold difference in the proportional size of the 'commercial market' between the US (5%) and the EC (30%).

The US and European space efforts (1991)			
	US space industry	EC space industry	EC as % of US
Total sales (billion Ecus)	26	2.5	9.6
Government markets	24.7 (95%)	1.75 (70%)	7.1
- military	13.85(53%)	0.25 (10%)	1.8
- civilian	10.85(42%)	1.5 (60%)	13.8
Commercial	1.3 (5%)	0.75 (30%)	57.7

(Adapted from European Commission, The European Community and Space, 1992)

Despite the 'structural disadvantage' of a small military demand for space products, European industry has obtained success in the 'commercial' launcher market and a respectable performance in the field of commnications satellites, as the table below reveals :

US and EC Sales of commercial space products(1990)			
(Figures in million Ecus)	**US space industry**	**EC space industry**	**EC as % of US**
Launchers			
Total sales	1200	560	46.7
- govt markets	840	84	10
- commercial	360	476	132
military as % govt.	60% (720)	5% (28)	4
Comsats			
Total sales	2230	400	18
- govt. markets	1670	160	9.6
- commercial	560	240	42.9
military as % govt.	65% (1450)	20% (80)	5.5
govt. as % total	75%	40%	

(Adapted from European Commission, The European Community and Space,1992)

4.4. Conclusion

This chapter has presented the industrial background in France and Europe, to the making of French space policy, it has shown that the European space industry is highly concentrated, with a small number of large powerful firms surrounded by a much larger number of parts and component suppliers. In comparison with the US space industry, the European Community peformance in markets and business is still small, largely because of the considerable diference between the military sectors in the US and in Europe, but despite this 'handicap', the French led ESA programme of Ariane launchers has been a success, and French and European satellite activities are developing strongly.

Despite the smaller size of the European space effort, the 'limited' French and European successes achieved in the face of structural disadvantages of size and funding show that European space activities can bring positive results. In 1992 and 1993, when the European Commission was militating in favour of increased Community (rather than inter-governmental) control of the ESA-dominated European space effort, the 1992 issue of the Panorama of EC Industry-Statistical Supplement gave the following description of the European Aerospace industry, emphasizing its importance:

> The sector is characterised by complex, very high-value products in relatively small quantities, as well as by long development periods and high development costs. This results in a high capital requirement and high investment risks both for manufacturers and users. The high technological requirements in the military segment, intensive international competition in the civil segment and working in new fields of technology (space flight) necessitate a particularly high level of research and development (high R&D expenditure). As a result of this the aerospace industry is a high development provider and user of new technological processes and products.[28]

In the following second section of the thesis we examine how the French space agency CNES interacts with government in the making of space policy.

Notes to Chapter 4

1 The figures are adapted from The European Space Industry (Euroconsult, Paris, 1992).

2 GIFAS is the French aerospace industry association, the acronym stands for Groupement des industries aéronautiques et spatiales.

3 Chesnais, François, and Serfati, Claude, L'industrie militaire, "une locomotive du développement économique français ?", chapter 6 in Chesnais (ed), Compétitivité internationale et dépenses militaires, CPE/Economica, 1990, p.180.

4 Ibid., pp.188-189.

5 Arena, R., de Bandt J., Benzoni, L. (eds.),Traité d'économie industrielle, Economica, 1988.

6 The description of the sector as being 'the aeronautics and space industry' is accurate, but also indicative of the frequent difficulties of quantitatively separating the two elements of' aerospace'. The three groups which make up the aeronautics (and space) industry interpreted in this way are Aérospatiale, Snecma and Dassault-Brégue, ibid., p.184.

7 In all, there were fifty 'founder shareholders'.

8 Crédit Lyonnais 0.5%, BNP 0.5%, Banque Vernes 0.2%, Société Générale 0.4%, Banque Paribas 0.4%.

9 The American launcher industry is the most voluble critic of the Arianespace approach to commercial satellite launching, since they feel that the European launcher is an unfair competitor, benefitting unduly from an inherited, fully developed launcher funded by government money.

10 Charles Bigot, chairman and CEO of Arianespace, speaking at the celebration of 50 Ariane launches and 100 contracts, 18 May 1992, reported in Arianespace Newsletter, June 1992, No.67, p.4.

11 Cohendet, Patrick, and Lebeau, André, Choix stratégiques et grands programmes civils 1987 p.152.

12

Ariane Launches 1992 - 1994

Flight	Date	Launcher	Satellite(s)
V56	May 93	A42L	*Astra 1C*
V57	June 93	A42P	Galaxy IV
V58	July 93	A44L	*Hispasat 1B* and Insat IIB
V59	Sept. 93	A40	*Spot 3*
V60	Oct. 93	A44LP	Intelsat 701
V61	Nov. 93	A44LP	Solidaridad 1 and *Meteosat 6*
V62	Dec. 93	A44L	DBS 1 and Thaicom 1
V63	Jan. 94		Failed. Turksat 1A and *Eutelsat II-F5*
V64	Summer 94		Intelsat 702
V65	Summer 94		PAS-2 and BS-3N
V66	Summer 94		Turksat 1B and Brasilsat B1
V67	Summer 94		Telstar 402

(Compiled from Arianespace Newsletter)

13 Since the late-1980s, when industry prospects were very favourable for the space sector, world recession in general and decreasing military spending worldwide in particular have tended to squeeze employment in the space and defence divisions of most of the major French aerospace firms. After a relatively good year in 1991, when profits and employment remained near their 1989/90 levels and a difficult 1992, Aérospatiale was obliged to reduce its overall employment by 1145, including 475 from the division 'Défense-Espace'. The 1994 turnover of GIFAS members overall is expected to be 20-25% lower than in 1991 (See Le Monde 15 January 1992, , p.27, Le Monde, 13-14 September 1992, p.17).

14 In 1993 Aérospatiale was threatened with privatisation by the new Balladur government, although the move towards such a privatisation was described as likely to be 'very progressive'. Le Monde July 8 1993, p.8

15 See Chesnais, Op. cit., p.212, for a brief criticism of the inadequacies of the *'Nomenclature d'activités et de produits'* (NAP).

16 Dieli/Ministère de l'industrie, 20 Ans de conquête française de l'espace, 1981, p.51.

17 'Aérospatiale mise sur le missile M5, Hermès et les satellites militaires', Air et Cosmos, No.1364, 3-9 février 1992, pp.10-11.

18 *'Nous définissons actuellement avec la Défense la façon de maintenir les compétences de la division dans le domaine balistique stratégique, si possible en avançant le progrmme de nouveau missile nucléaire stratégique naval M5 et de son éventuel dérivé terrestre S5'*, Aérospatiale mise sur le missile M5, Hermès et les satellites militaires, Air et Cosmos, No.1364, 3-9 février 1992, pp.10-11.

19 In 1982, subsequent to the nationalisations, the public sector in France accounted for thirteen of the twenty major industrial groups, 24% of industrial employment, 32% of turnover, 22% of exports, 27% of total investment and 50% of research spending.

20 Les enjeux de l'espace, La documentation française,1982, see the Literature review for a detailed treatment of this work.

21 *'une très large proportion des ingénieurs des grandes écoles de la Société sont employés par la branche Espace qui constitute donc naturellement un vivier de talents et d'expériences que le groupe Matra utilise largement soit pour créer de nouvelles activités soit pour pourvoir des postes de responsabilité'*. Ibid., p.110.

22 *'. . . la synergie entre les activités spatiales de Matra, bien que difficilement quantifiable, est un élément important dans le développement du groupe et va bien au-delà de la contribution de l'espace au chiffre d'affaires de la société'*. Ibid. p.110. In June 1989 Matra Espace was awarded a quality certificate RAQ-1 by the DGA's industrial quality control body, reflecting the attainment by the company of the highest quality criteria. See La Lettre du CNES, No. 122, juin 1989, p.11.

23 Shares of many if not all of the twelve firms privatised (and particularly those of Matra) were offered at a considerable discount of their 'real' value.

24 *Matra tient toujours à demeurer maître de son destin et de son développement. C'est pourquoi tout échange de participation nous verra toujours majoritaire chez nous'*.

25 La SEP s'est maintenue en 1992, Air et Cosmos Aviation magazine, No.1409, 18-24 janvier 1993, p.12.

26 Euroconsult, Entreprises spatiales européennes, (Euroconsult, Paris, 1990), p.216.

27 La Lettre du CNES, No.132, 26 février 1991, p.9.

28 Panorama of EC Industry- Statistical Supplement, (European Commission, 1993), p.13-45.

Section I I THE CENTRE NATIONAL D'ETUDES SPATIALES AND GOVERNMENT

The second section of the thesis deals essentially with the *Centre national d'études spatiales*, the civil national space agency set up in 1961-62 by France to stimulate the development of French space industry and to 'manage' national space activities for the state. The section comprises three chapters which each address different aspects of the space agency's place in the overall 'space sector'.

Chapter 5 examines the rôle and organisation of CNES, its activities, and the level and mechanisms of its funding. This analysis shows how the space agency benefits from a special administrative status as a semi-public intermediary institution, has had privileged access to funding and undertakes a wide range of tasks in the execution of its statutory missions.

Chapter 6 examines the interactions between CNES and government departments which have various interests in space during the period 1979-1988, namely the Industry ministry, the Finance and Budget ministry, the Foreign affairs ministry and the Science and Technology ministry. This analysis reveals that the pattern of *tutelle* during most of the 1980s was complicated and confused thereby allowing the space agency the potential to define its own development.

Chapter 7 examines the change in the interaction between CNES and government that was brought about in 1988 and 1989 by the creation of a 'Ministry of Space' and of other bodies intended to increase the state's capacity to monitor CNES's rôle and activities. This analysis shows how the Rocard administration in power from 1988 to 1991 attempted to reform government's interaction with the agency in line with its general ambition to modernise and rationalise the state.

The order in which these subjects are addressed reflects the need to understand the nature of CNES as a state agency and its activities before assessing how it relates to government in practice. The relationship between the space agency and the state that is revealed in Chapter 6 forms the background to the institutional innovations of 1988 and 1989 and the development of government's attitude towards space in the early 1990s which are discussed in chapter 7.

After this analysis of the way in which space policy and the practice of the overall space effort originate from the civil side of French space activities, Section III of the thesis will investigate the military contributions to French space deriving from defence policy and military strategy, the organisation of French military space and the industrial development of the military space programmes. Overleaf however, we introduce CNES as a state agency leading a high-tech sector.

5. CNES Rôle, organisation and missions , Activities, Funding and budgets

In this chapter we shall look at the role the French national space agency is intended to fulfill by government, then present the organisation of the agency which has been developed to carry out this role and the activities which CNES undertakes. The third section of the chapter addresses the issue of CNES funding. The structure of the chapter is thus the following :

- **5.1.** CNES Rôle, organisation and missions
- **5.2.** CNES Activities
- **5.3.** CNES Funding and budgets
- **5.4.** Conclusion

5.1. The Role and organisation of the *Centre national d'études spatiales*

The shortest and most elegant definition of CNES is that it is an '*organisme public scientifique et technique à caractère industriel et commercial'.* Short and elegant but also somewhat sybilline, this formulation is completed in article 1 of the CNES founding law of 1961 by mention of the two features of 'financial autonomy' and attachment to the Prime Minister's office.[1] CNES is thus something of a hybrid in nature, since it is charged with developing scientific-technical and industrial-commercial activities, and in terms of its independence of action it is simultaneously 'autonomous' and under the control of the Prime Minister. Over CNES's lifetime, the different contents assigned to each of these notions, and the interplay of precedence between the varied characteristics expressed in the definition have mirrored the form and content of Space policy.

5.1.1. The *'établissment public à caractère industriel et commercial'*

The *établissement public à caractère industriel et commercial* (EPIC) represents an important conceptual characteristic of French science and technology development, namely the state's belief that it can create hybrid high-tech organisations combining public-sector statutes and private-sector efficiency. During the late-1980s and early-1990s there has been some questioning of this belief, doubt being focussed on the 'ambiguity' of the organisational format of the EPIC rather than faith being placed in its flexibility.[2]

In legal administrative terms, EPICs are one form of *établissement public d'intervention*, or public sector economic intervention establishment . The *établissement public* antedates the Fifth Republic, but article 34 of the 1958 Constitution authorises government to create such organisations. There exist a number of EPICs in the agricultural sector, such as the *Office national interprofessionnel des céréales*, and, more importantly, in the industrial sector, such as CNES, the national marine research organisation Ifremer, the *Institut national de recherche chimique appliquée*, and the *Centre d'études des systèmes et technologies avancées*. Again in legal administrative terms (the statutes of such institutions are determined by *'le Droit administratif'*), EPICs are *'personnes publiques spéciales'* and are subject to the principle of *'spécificité fonctionnelle'* by which the totality of their rights, duties and infrastructures are focussed on a single objective as defined in their founding statutes.

EPICs in general are a form of *gestion administrative décentralisée*, through which the state, or other state structures can manage an activity. *'Décentralisation'* has to be distinguished from *'déconcentration'* - (which refers to the delegation of authority or to the empowement by statute of lower levels to take decisions) - since decentralisation implies a continual overseeing of the decentralised authority by the state. *Gestion administrative décentralisée* produces the problem of control (and also potentially the problem of relations between separate decentralised activities). The function of 'oversight' or 'control' is terminologically and conceptually defined by the notion of *'tutelle'*.

Technically, *'tutelle'* is distinct from what is simple *'subordination hiérarchique'*, since the decentralised activities are supposed to enjoy a degree of autonomy from the governmental/state hierarchical superiors from whom they are decentralised. However, the definitions of 'EPIC', of 'administrative decentralisation' and of *'tutelle'* are loose enough to produce ambiguities in the exact legal and practical status of some EPIC institutions such as CNES. CNES is usually considered to be a standard EPIC, but the actual relationship between the space centre and the state as defined in its founding law is one in which 'tutelle' is of an ambiguous nature. Article 1. of Loi nº 61-1382 instituting CNES states that the agency is *'placé sous l'autorité du Premier ministre'*. The fact that the founding statutes prefer *'sous l'autorité du Premier ministre'* to the more usual *'sous la tutelle de'* or the less restrictive *'sous le contrôle de'* implies a special link between the space centre and the state in the form of the Prime Minister's office. Some legal experts are of the opinion that *'sous l'autorité de'* reflects not a relationship of decentralisation, but more a form of administrative *'déconcentration'* characterised by *subordination hiérarchique*. The differences in interpretation

which are possible between *'autorité'* and *'tutelle'* are doubtless sufficient to create tensions over the real autonomy of the space centre from government.

5.1.2. The 'elaboration' of space policy

The 1961 statutes of CNES stated that the 'single objective' of the agency was to prepare, propose to government, and implement national space policy.[3] Before modifications brought about in the elaboration of policy in the late-1980s, (which will be examined in the following chapters), CNES was responsible for the preparation of policy initiatives which which were submitted by its *Conseil d'administration* to its tutellary authorities, who then communicated them to the Prime Minister's office. The Prime Minister and the government then transmitted these proposals to the President who discussed them with the Prime Minister and the heads of relevant ministries in a restricted cabinet meeting (*Conseil restreint*) or interdepartmental meeting (*Conseil interministériel*). In this way it was essentially the Prime Minister and the Head of State who took the final decisions concerning space policy, on the basis of proposals furnished by CNES. Depending on the period and on the presidential interest in space matters, the meetings to define space policy usually took place about once every two years.

Thus for example during the 1970s, space policy was defined and refined at the *conseils restreints* of 14 May 1970, 30 November 1972, 14 October 1974, 20 February 1979 and 17 April 1980. At the 1979 meeting it was decided to reorganise CNES, to produce and commercialise the Ariane launcher, and to continue the development of Telecom 1. At the meeting of April 1980, it was furthermore decided to undertake preliminary studies for Ariane V.

During the period 1980-1989 there were in total four meetings of the *conseil restreint* and one *conseil interministériel*, presided either by the President of the Republic or by the Prime Minister, until in 1989 new methods of deciding policy were introduced. The table overleaf summarises these meetings :

Meetings of *Conseils restreints* on space policy 1980-1987	
Date	**Subject**
17 April 1980	*Conseil restreint* chaired by President deciding pursuit of preparatory studies for Ariane V.
15 October 1981	*Conseil restreint* chaired by President, deciding the development of Ariane IV and of Spot 2.
14 June 1984	*Conseil restreint* chaired by Prime Minister, discussing French space policy over 15 year period. Decisions : encourage the use of space facilities, products and services; prepare launcher capabilities for the 1990s; prepare European autonomy in strategic space applications.
17 October 1986	*Conseil restreint* chaired by Prime Minister deciding the pursuit of an autonomous European manned flight programme and participation by CNES in Hermès preparatory programme up to 45% of programme costs.
October 1987	*Conseil interministériel* confirming the continuation of Earth observation programme and Spot 3 project.

(Source : CNES Annual Reports, La Lettre du CNES)

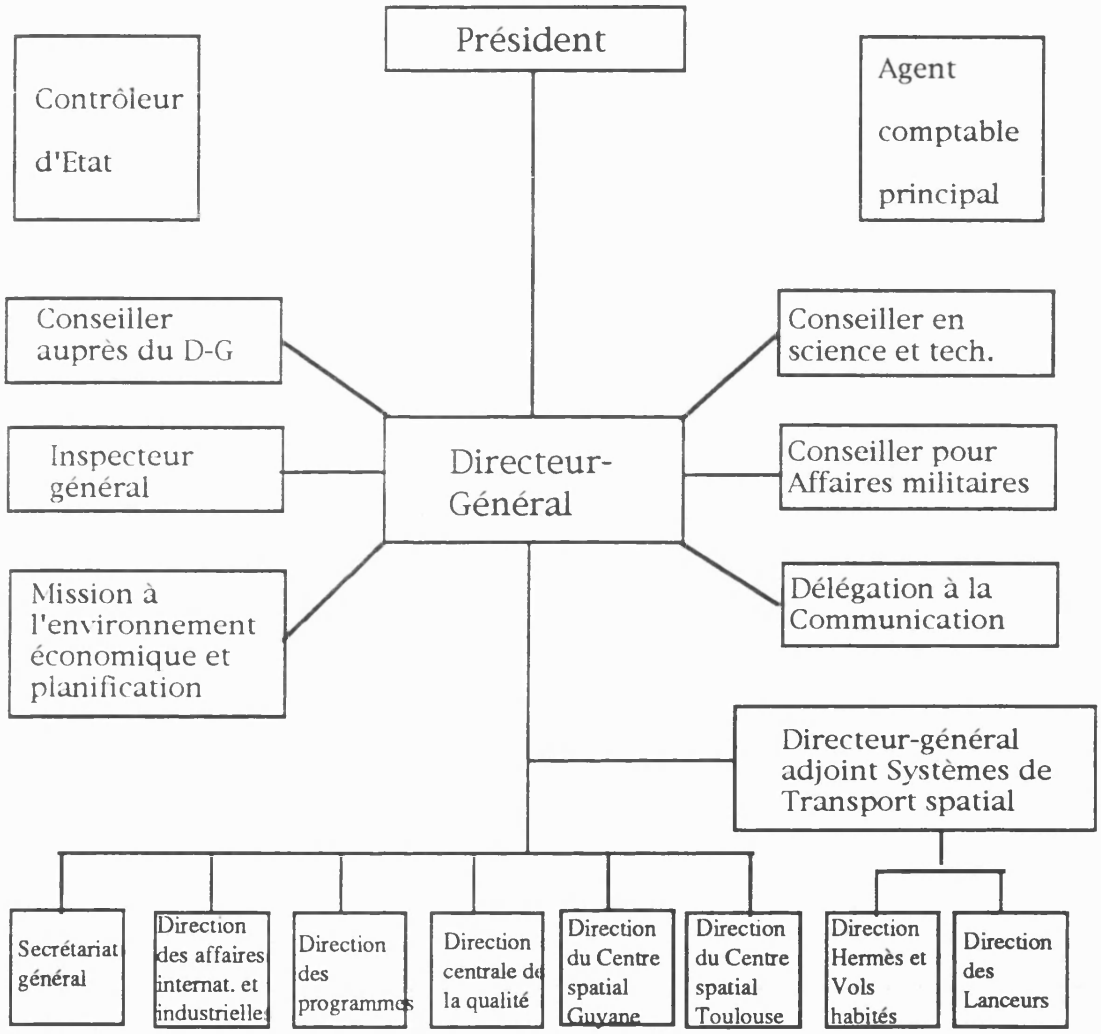
These meetings thus ratified CNES's suggestions for its activities.

5.1.3. CNES Organisation and missions

CNES's statutes, and the missions which they entrust to the agency are reflected in the organisation of the Space centre's work and the activities it pursues. From an original staff of less than twenty in 1962 housed in the *rue de Lille*, followed by a period at *rue de l'Université*, in 1992 CNES employed some 2,400, a considerable rise from the 1980 level of 1,080, a high proportion of them being engineers from the aerospace and high-tech *'Grandes Ecoles'*.[4] Now sited in a prestigious location overlooking the development area of *Les Halles*, the agency's central headquarters are still in Paris but operations and technical establishments exist in Toulouse, the Paris region at Evry, and Kourou (French Guyana) where the Ariane rockets are launched. The organisational chart of the agency and the activities it runs exemplify both the relations between CNES and the political authorities and other branches of government (non-tutellary ministries, other state scientific and technical establishments for example), as well as the fundamental objectives assigned to the high-technology space sector.

We shall first briefly examine the organisation of CNES, and then consider the programmes and other activities themselves.

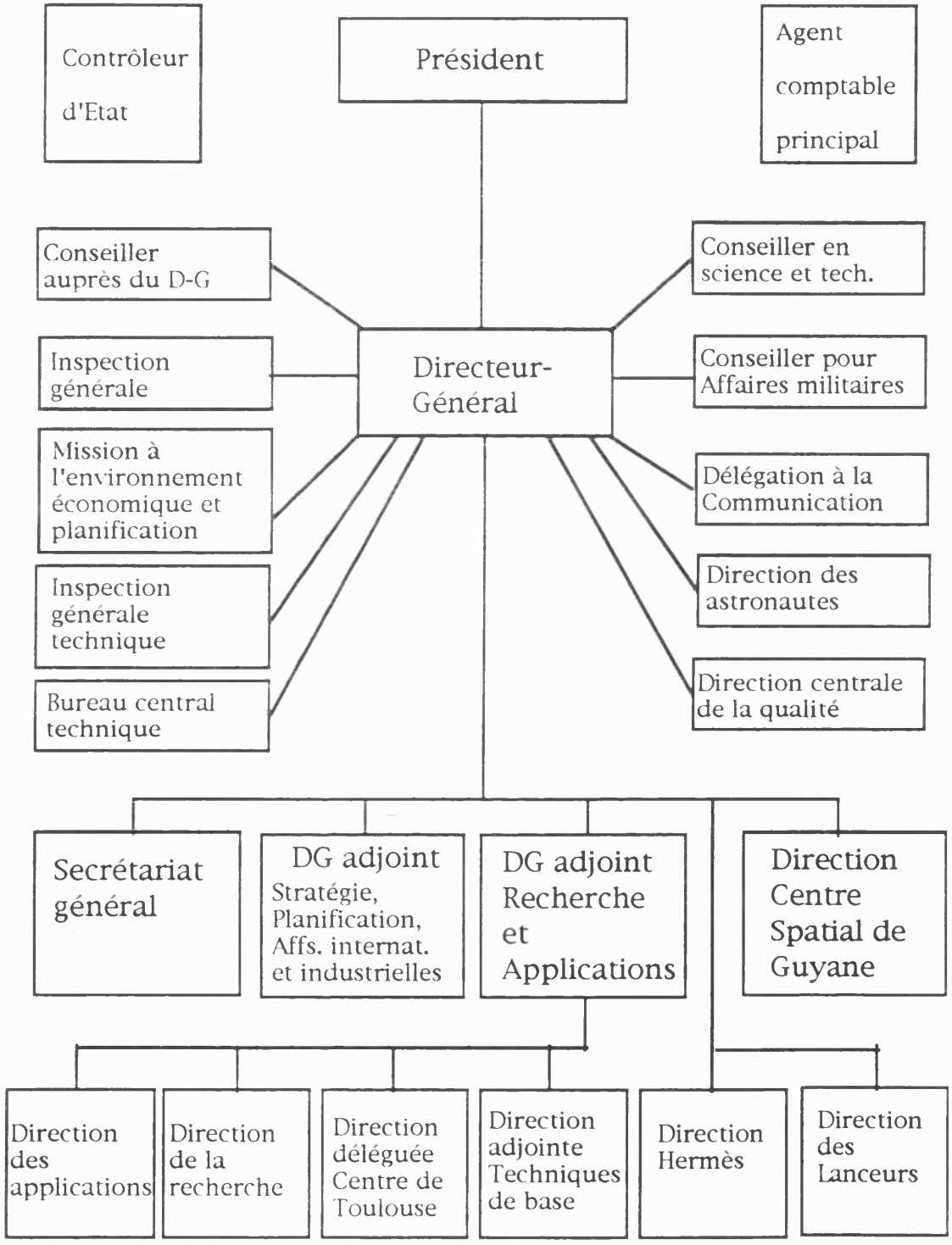
Organisational chart of CNES 1989 (simplified)



(From CNES Annual Reports)

This was the organisational structure of CNES that held through most of the 1980s. It shows the variety of concerns and activities of interest to the space agency, foremost amongst which were the Launcher, Hermès and manned flight programmes, whose increasingly central importance to CNES was reflected in their attachment to a vice Director General in charge of what was known as 'space transport systems'. In comparison with space transport's privileged status, the other directorates of the agency suffered from their subordinate hierarchical position and from competition between themselves, leading to a redrawing of the agency's institutional structure in 1992 in which a different balance of status was created.

Organisational chart of CNES 1992 (simplified).



(CNES Annual Report 1992)

In this structure, Hermès and Ariane are the responsibility of the Director General, and the other activities of the agency are supervised by two vice Director Generals, in order to protect their place within the the organisation

5.1.4. The *Conseil d'Administration*

CNES's governing board, the '*Conseil d'administration*' is made up of nineteen members, who are appointed in three different ways. Seven members are appointed as state representatives by the Ministries involved in the individual space programmes. In 1991-92, these *'Représentants de l'Etat'* represented the Prime Minister (the *Secrétaire général adjoint de la Défense nationale*), the Minister of the Economy (the *Directeur des Relations économiques extérieures au Ministère de l'Economie, des Finances et du Budget*), the Budget Minister, the Defence Minister (the *Directeur des Missiles et de l'Espace* at the DGA), the Foreign Affairs Minister (the *Directeur adjoint des Affaires économiques et financières*), and naturally the Industry and Research and Technology Ministers.[5] Respect is paid to democracy through the election of six members by their fellow employees representing either unions or pressure groups within the Centre itself.[6] Four members are co-opted to serve on the board because of their special expertise in particular fields of activity of the agency; these members currently represent the disciplines of meteorology, aeronautical engineering, satellite broadcasting and satellite telecommunications. In addition to these members the governing board is completed by its President René Pellat (appointed November 1992) who succeeded Jacques-Louis Lions (in post since 1984), and by the '*Commissaire du Gouvernement*', in 1992 Michel Petit, *Délégué Général à l'Espace* at the Ministère de la Recherche et de l'Espace (MRE).[7]

This particular composition of the *Conseil d'Administration* creates a potential voting imbalance between those members representing immediate governmental interests, such as the representatives of the various ministries and the *Commissaire du gouvernement* and those members originating from the space agency itself. The table below shows this division of the Council's membership :

Potential voting imbalance in CNES *Conseil d'Administration*

'Government'			**'Agency'**		
Commissaire	Ministerial representatives	v	Employees	Experts	Président
1	7		6	4	1
8			**11**		

Such an imbalance means that in principle the agency representatives can see their own views prevail against the numerically weaker government representatives, although government still has the power of veto in the last instance through its control over agency funding. This scenario of outright conflict between government and agency is of course an extreme case of interaction, but the structural composition of the *Conseil* does nevertheless in normal circumstances restrict the power of political representatives to influence decisions. In addition to their minority position within the council, ministerial representatives are of course also handicapped by their lack of technical expertise concerning the subjects under discussion which are proposed by the agency.

When approved, the decisions of the *Conseil d'administration* are put into everyday practice by the *Direction générale*, headed by Jean-Daniel Lévi (1992) as Director General. The *Directeur Général* manages the work of the administrative services of the *Direction générale* and is assisted in addition by a number of advisors (on science and technology or on military affairs for example), by a planning and forecasting service and by a public relations office. The functions of political control from outside the agency are exercised by the *Contrôleur d'Etat* and by the *Agent Comptable principal*.

Specialised directorates

Below the level of the central administration of the agency's activities a number of specialised directorates or divisions deal with tasks such as the management of quality control, or International and Industrial affairs and programmes. Thus a special post of Vice-Director General exists to supervise strategy, planning and industrial and international affairs, and another *délégué général adjoint* deals with applications programmes and research. The launcher and associated programmes (Ariane and *Hermès*) are headed by programme directors who report directly to the Director General in reflection the importance of the launcher programme for CNES. The *Direction des Lanceurs* is located at Evry, and the Direction responsible for *Hermès* and for manned flight forms part of the Toulouse Space Centre.[8] Headed by Bernard Estadieu, this *Centre Spatial de Toulouse* created in 1968 groups all the activities of CNES except launchers and thus goes a long way in isolation to contributing to the high-tech reputation of the Toulouse area.[9]

The structure and organisation of CNES are complicated, reflecting the variety of responsibilities undertaken by the agency in its rôle as an EPIC. As we

have seen, these range from managing the Kourou and Toulouse 'space stations', to stimulating research in space science in the French scientific community and the leadership of the research and development programmes for projects such as Ariane V and Hermès.

We shall now examine CNES activities in more detail.

5.2. Activities in the 1980s : 'Commercialisation' and *coopération.*

During the 1980s, the French space sector developed in a number of ways within the general shift towards attempted 'commercialisation' of products and services. The Europeanisation of the space programmes was continued, albeit with fall-backs to national projects in certain fields. Indeed, over-enthusiasm on the part of CNES for European cooperation, as exemplified in the agreements of The Hague in 1987 to pursue the Ariane V, *Hermès* and *Columbus* projects created a double awareness in government that the ambitions of the National Space agency needed to be controlled, and also that national ambitions in space activities were becoming increasingly difficult to cultivate, given the trends towards specialisation of national industries and the need to pool funding cross-nationally to meet huge costs. Another major trend of the 1980s was that of the renewal of overt interest in military space activities. This trend, dealt with in detail below in the section on military space, was initiated essentially by the Strategic Defence Initiative and its real, imagined and potential effects on European security in general and on the credibility of the French Deterrent force in particular.

5.2.1. Activities and Programmes.[10]

The activities undertaken by CNES and the programmes that it directs can be classified in a number of ways. An obvious distinction that can be drawn is that of the scientific or technological nature of the activity, another concerns the stage of maturity of the activity within its lifetime (research-development-production-commercialisation for example). Programmes and activities can also be considered in terms of the scientific or industrial partners they involve, and a classification in terms of national, bilateral, multilateral or 'export' gives an international relations perspective to analysis. For this study, we will consider the programmes in terms of a classification combining the practical definition of the nature of a programme in terms of CNES's missions and in terms of the scientific

or technological content of the project. This approach distinguishes between 'applications' programmes, 'scientific' programmes and research and technology campaigns.

Applications programmes

Applications programmes are those programmes in which space activities have some immediate practical use in society as a whole. Current applications programmes cover the Ariane family of European satellite launchers, telecommunications and observation satellite systems and meteorological and data collection/platform location satellite systems. *'Le transport spatial'*, as the launcher programme has come to be known in CNES parlance, covers the operational Ariane I to Ariane IV family of rockets developed by European (in fact mainly French) industry for the ESA under the direction of CNES. The production of the launchers and the commercialisation of launcher services is managed by the CNES subsidiary Arianespace. Closely associated with the launcher activities currently in application are the three *'grands programmes en développement'* (the major programmes in preparation which the ESA and France agreed to undertake at the Hague in 1987). These onerous projects are the Ariane V heavy launcher, the Hermès space shuttle to be carried by a version of Ariane V, and the Columbus space laboratory representing the ESA contribution to the NASA international space station.

The satellite applications programmes cover the range of techniques using satellite technology. Telecommunications are represented by the *Télécom 1* series of satellites and by the preparation of the replacement *Télécom 2* series. Direct broadcasting by satellite is represented by the TDF 1/TV SAT systems and also by TDF 2. Data collection and platform location are provided in the Sarsat-Cospas system, whose most well-known use is in search and rescue operations. Earth observation includes the SPOT series of satellites (*'la filière SPOT'*)[11], providing a satellite photograph service commercialised by the CNES subsidiary Spot Image SA. In collaboration with the *Direction de la Météorologie nationale*, CNES is preparing the second generation of *Météosat* satellites for weather forecasting.

Space science

As well as the applications programmmes, CNES promotes work on space science research. This is represented by the scientific programmes carried out nationally,

bilaterally, within the ESA framework or with other groups of countries. CNES does not possess any space science laboratories itself, its activity in the scientific programmes being restricted to the support of research teams and laboratories of the CNRS (the French national scientific research organisation,) universities or the *grandes écoles* and other government research establishments. In 1988, the national scientific programme effort amounted to some 52 million Francs, compared with ESA science programmes at 56 million francs and bilateral (essentially superpower) cooperation funded at 185 million francs. CNES spending on national science programmmes represented 0.8% of the total spending of the agency and overall spending on science 8%.[12] The programmes supported by this funding range from astronomy through geophysics, microgravity and oceanography to materials science. The work thus stimulated by CNES irrigates some 60 projects in fourteen laboratories in France.

Research and Technology

The final aspect of CNES activities is represented by the Research and Technology programmes. Instituted in the early 1980s, these programmes are an attempt to recreate the vitality of the space sector in the early 1970s which was perceived at the time as the grounding for the success of the industrial development of the major programmes such as Ariane and SPOT. During the 1970s however, the proportion of CNES funds devoted to research and technology development decreased during the latter years of the decade as funds were devoted to the industrial phases of *Symphonie, Météosat,* SPOT and Ariane. A *Conseil restreint* (special restricted cabinet meeting of those Ministers directly involved in space matters) in October 1981 agreed on the necessity of strengthening essential R & D in order to meet the challenges expected in the design and economics of space systems in the period 1990-2000. The fall-out from these research and technology programmes was also intended to maintain the level and competitivity of French industry and to allow the continuing improvement of existing applications programmes. To date the medium-term pluriannual plans have been implemented, the first for 1983-85 and the second for 1986-88. In 1988 the 236 million francs devoted to this activity was split 71% : 29% in favour of space vehicles over launchers.[13]

These then are the various scientific and technological/industrial activities engaged in by CNES and for which funding is provided either through the PTT/MPTE *'budget annexe'* (programmes and capital investment) or through the Research Ministry/MRT allowance for the operating costs of the agency. CNES is

also involved in stimulating the economic, financial and industrial aspects of the French space sector, and it is to these activities that we now turn.

5.2.2. CNES subsidiaries and *Groupements d'intérêt économique*

In its rôle as the directing force in the development of the French space industry, CNES has stimulated the creation of new space sector companies when it has felt there to be the need for such structures in industry for the smooth evolution of space activities. CNES is involved in subsidiary companies (or *filiales*), which it either partially or wholly owns, and *groupements d'intérêt économique* (either GIE industriels, or *GIE scientifiques*). As of 1992, the main subsidiaries in which CNES participates numbered seven, and there are four principal *groupements d'intérêt économique industriels*, as the table below illustrates:

CNES subsidiaries and *groupements d'intérêt économique*

	Firm/ GIE	Created	CNES % of shares	capital
Arianespace	SA	12/1980	34-32%	270mF
Arianespace Inc.	SA	12/1982	100%[1]	0.1mF
S3R	SA	01/1986	100%[1]	28mF
Intespace	SA	01/1983	38.775%	8mF
Spot Image	SA	07/1982	39%	34mF
Spot Image corp	SA	12/1982	100%[2]	2.9m$
Sat Image corp.	SA	1983	6%	
CLS-Argos	SA	04/1986	55%	15mF
Service Argos Inc.	SA	05/1986	100%[3]	0.3m$
Novespace	SA	06/1986	48%	5mF
Locstar	SA	10/1988	15%	100mF
SCOT Conseil	SA	09/1987	100%	1.3mF
Simko	SA	1968	40%	4.2mF
GDTA	GIE	1973	-	-
Prospace	GIE	07/1974	-	-
Satel Conseil	GIE	07/1978	-	-
Sat Control	GIE	12/1985	-	-

1 - 100% owned by Arianespace, 2 - 100% owned by Spot Image.

3 - 100% owned by CLS.

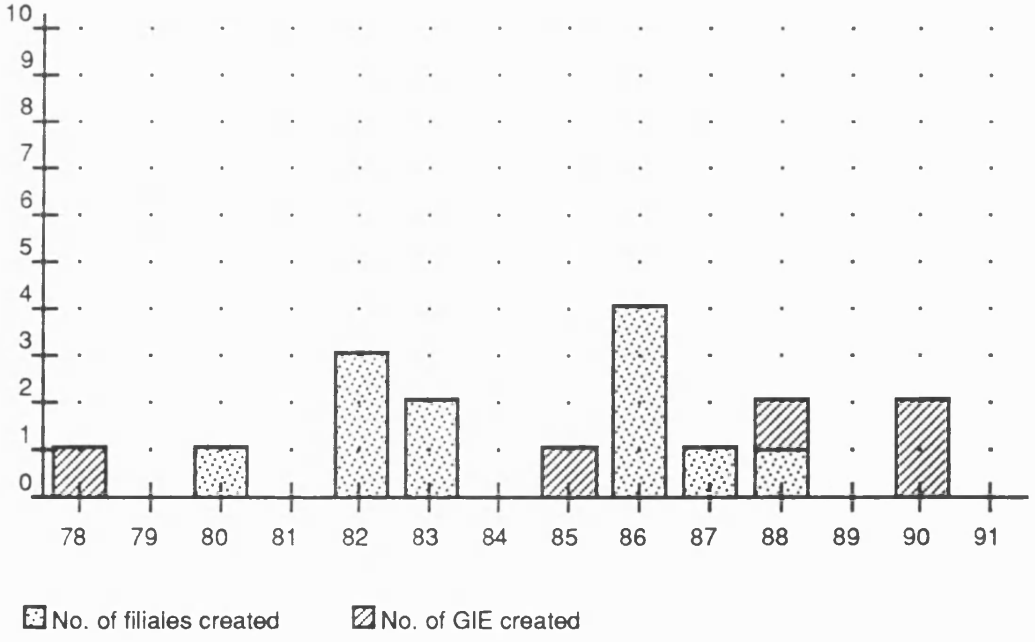
(Source CNES, Rapports Annuels 1989, 1990, 1991, 1992)

The rationale behind CNES involvement in creating new industry structures such as its *filiales* (subsidiaries) and the GIEs is repeatedly stated in agency documentation - the rationale is both a justification of CNES action in undertaking responsibilities additional to its traditional rôle of managing the development of industry and a reflection of the belief that the agency should act to stimulate the

continuing development of the sector. The 1991 report on the activities of the agency stated the rationale in terms of a duty to itself maintain and encourage the expertise and skills of science and industry, including in such a rôle the creation of 'innovative' commercial and industrial bodies.[14]

The *groupements d'intérêt économique* were the initial form of CNES's ambition to expand its input into the workings of the space sector. As the turnover and employment figures presented below reveal, the GIEs are the least commercially developed of the agency's ventures, and as the discussion of their members and activities will also show, they are essentially concerned with promotional and informational tasks. A cursory analysis of the dates of creation of the subsidiaries reveals two periods in which CNES particularly felt the need to institute new 'commercial and industrial structures', namely the early 1980s and 1986-87, as the graph below illustrates :

Creation of CNES filiales and GIES 1978-1991



(Source CNES, Rapports Annuels)

These two periods coincided with government enthusiasms for the use of high-technology industry as a catalyst for society and the economy, although in different ways. From 1981 until approximately 1984, government thinking on science, technology and industry under the Socialists centred on a 'Jacobin' approach in which central control and direction could channel developments for industrial and commercial success. During 1986-87, the prevailing 'ideology' of science and industry was the professedly neo-liberal one of the right wing governments of the

two years of political Cohabitation between an RPR neo-Gaullist Prime Minister and a Socialist President. Under the aegis of the particularly liberally inclined Industry minister Alain Madelin, with whom responsibility for space was lodged during this period, CNES took advantage of this ideology to create technology transfer, satellite consultancy and satellite positioning subsidiaries.

The following table gives the latest available employment and turnover figures for CNES subsidiary companies and for the *groupements d'intérêt économique* (GIE) in which the space agency is involved.

CNES filiales and GIEs : Employment and Turnover (1989 -1992)

	1989		1990		1991		1992	
	Turnover (,000 FF)	Staff	Turnover (,000 FF)	Staff	Turnover (,000 FF)	Staff	Turnover (,000 FF)	Staff
Filiales								
Arianespace	3794	268	3979.2	270	6028.1	287	4998	287
CLS Argos	45	54	69.6	90	79.2	96	39	113
Intespace	158	158	104	155	93.9	153	205	156
Novespace	6	8	9.5	10	16.1	10	16	11
Locstar	4	10	-	25	-	-	-	-
Scot Conseil	15	8	22.0	27	24.4	29	27	29
Simko	65	59	73.0	60	84.0	70	97	60
Spot Image	140	113	165.4	108	204.0	180	215	175
GIE's								
GDTA	25	19	24.0	28	23.8	31	22	32
Prospace	-	4	3.6	4	3.6	4	NA	NA
Sat- Conseil	6	12	13.0	9	10.9	9	5.2	9
Sat Control	39	39	-	-	-	-	-	-
Medes/Imps	-	-	7.0	9	6.15	9.5	10.5	10
Total	**4297**	**742**	**4470.3**	**795**	**6574.1**	**888.5**	**5634.7**	**882**

(Source CNES, Rapports Annuels 1989, 1990, 1991, 1992)

The table reveals the four main CNES subsidiaries are Arianespace, Spot Image, Intespace and CLS-Argos. These high-profile subsidiaries have the highest turnovers of the elements which make up the CNES 'group' and are the major employers amongst the subsidiaries and GIEs. They differ in nature to the extent that Arianespace is concerned with managing the production, sale and launch of the Ariane satellite launchers, whereas Spot Image and CLS-Argos market satellite-provided services and Intespace commercialises CNES technical facilities to industry. We shall now examine these CNES subsidiaries.

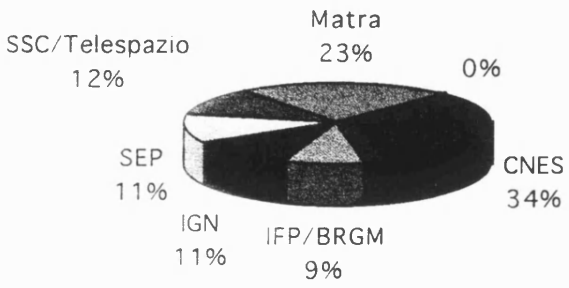
Arianespace

As one of the major firms of the French and European space sector, Arianespace is covered in some detail elsewhere in the thesis. It is of interest here for its rôle as the pioneer CNES subsidiary, since it was formally constituted as early as December 1980, as the ESA, under pressure from CNES and the French government conceded that the Ariane launcher programme would be better coordinated by a commercial company than by an international agency. CNES initially controlled 34% of Arianespace's shares, a figure which was reduced slightly to 32% in 1990 when the financial structure of the company was modified in recognition of the changes in the industrial contributors to the Ariane programmes over the period 1980-1990. Over and beyond the large shareholding that CNES has in Arianespace, the organisations are closely linked by virtue of CNES's prime contractorship for Ariane, and by the physical contiguity of the CNES *direction des lanceurs* (launcher division) and the headquarters of Arianespace at Evry in the Paris region.

Spot Image

The Spot Image company in which CNES initially had a 39% holding was created in July 1982 in order to promote the services of the Spot Earth observation satellite and to commercialise the images obtained by the satellite to eventual clients. CNES has a controlling share of Spot's capital, the rest of which is held essentially by French state and industrial concerns such as the National Geographical Institute (IGN), the Bureau of Mining and Geological research (BRGM), the Société européenne de propulsion (SEP) and Matra (since 1991 - Matra Marconi Space). The following table shows the exact ownership of the company :

% Shareholders of Spot Image



The first Spot satellite was not however actually launched until February 1986, when the turnover of the company climbed from zero to 15.8 million francs in ten months. The Spot 1 satellite was operational until 31 December 1990, overlapping for a year with Spot 2 which was launched by Ariane in January 1990. French industry is producing two further Spot satellites to take over from Spot 2 in the mid-1990s. The Spot programme has allowed France to acquire the techniques of Earth observation from space and expertise in the reception and treatment of satellite observation data on the ground. Part of the motivation for the programme was the desire to break the US monopoly on space imaging provided by the Keyhole series of military satellites and by the civil Landsat satellites (1972). Although the 10m resolution afforded by Spot is not as good as the 1-2m provided by Keyhole satellites, it is nevertheless better than Landsat's 20m definition. Currently, Spot Image competes with the Landsat /Eosat suppliers of satellite images.

The Spot satellites have been developed by Matra, working under the direction of CNES. A third of the development costs were provided by the Defence ministry, whose Hélios military observation satellites are based on the same satelite 'buses' (or platforms) and which use similar (if more precise and hardened technology). The Spot programme was initially proposed by CNES to the ESA in 1976 for 'Europeanisation' but found little support (except from Belgium and Sweden), and was therefore withdrawn to become a national programme with contributions from Belgium and Sweden.

Although Spot Image has created American and Swedish companies to help the promotion of the satellite and its services, the overall turnover for the company is still relatively low, although steadily increasing. In 1986, turnover was approximately 16 million francs, rising to 55 million francs in 1987. In the late 1980s and early 1990s, perhaps because of the increased need for military intelligence gathering created by developments in Eastern Europe and the Gulf area, Spot turnover increased to a more substantial level : between 1988 and 1991 turnover rose by 160% from 123 million francs to 204 million francs.

	1986	1987	1988	1989	1990	1991	1992
Spot Image turnover (million francs)	15.8	55	123	140	164.5	204	214.7

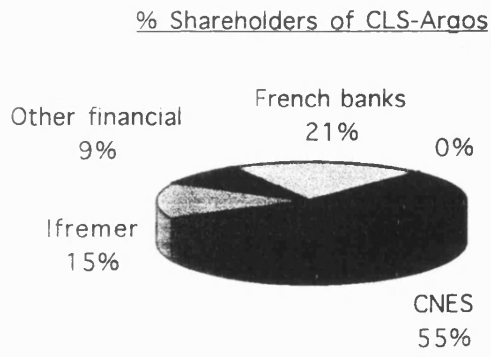
(Source : CNES Rapports Annuels)

Spot Image is presented by CNES as a successful form of commercialisation of space services contrasting with the less successful American experience with the

Landsat satellite and Eosat commercialisation of its images. In the running of Spot, CNES is considered to be the 'satellite operator', and Spot Image the 'commercial operator'. The Eosat/Landsat approach to the marketing of Earth observation services involves the exploitation of the state-owned (via the National Ocean and Atmosphere Administration) Landsat satellites by a private joint venture between Hughes and RCA (1985). The satellites themselves are controlled by the NOAA, the Hughes/RCA Eosat venture managing the sale of images and the production (with a government grant of $250 million) of a sixth satellite. This particular framework for the commercial sale of services from a government developed and owned satellite was derived from the Reagan administration's enthusiasm for market forces. Relations between the NOAA and Eosat have been difficult, because of the divergence between the public ownership of the satellites and the commercial rationale of their marketing agency. The Spot Image experience is deemed by the French to show the advantage of a company which mixes institutional (CNES, BRGM, IGN) shareholders and industrial partners in such a way as to retain links between the producers, managers and marketers of the system.[15]

CLS-Argos

CLS-Argos was created in 1986 in order to market satellite positioning and data collection services. The shareholders of CLS-Argos are CNES , the French Institute for research and exploitation of the sea Ifremer, and a variety of banks and other financial institutions.



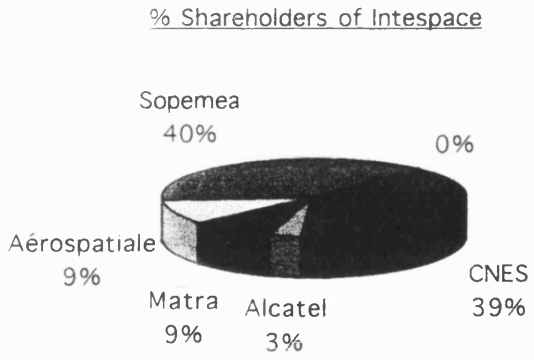
CLS-Argos cooperates with the US National Oceanic and Atmospheric Administration (NOAA), whose satellites carry the French Argos cartridges which relay data concerning location and environmental conditions.

	1986	1987	1988	1989	1990	1991	1992
CLS-Argos turnover (million francs)	-	-	-	45	69.6	79.2	91.7

(Source : CNES Rapports Annuels)

Intespace

Intespace was created in 1983 out of the *Laboratoires d'essais spatiaux français* which had been jointly run by CNES and the space industry since 1962. The new company Intespace was to provide commercially run space simulation and testing facilities to industry. In 1986 its major shareholders were CNES, Sopemea and the major representatives of the French space industry, namely Aérospatiale, Matra and Alcatel.



The *Groupements d'intérêt économique industriels*

The GIEs are particularly involved in the promotion and encouragement of the space industry through the collecting and dissemination of information, through publicity actions, through training and through *'valorisation'*. As their name implies, the GIEs are groupings of state organisations or companies who see a common need or a common advantage in a certain field and who believe that the creation of a GIE could contribute to furthering their interests. GIEs function on a contribution and a commercial basis in the sense that their members contribute funds to the *groupement* which can also derive funds from its activities. The GIE

represents a flexible and economic structure for stimulating the development of the space industry.

GDTA

The Groupement pour le développement de la télédétection aérospatiale was formed by CNES and the *Institut géographique national* in 1973 in order to provide an organisation capable of developing various remote sensing and training users to exploit data from satellites. The original public sector ('institutional') co-founders were joined in 1975 by the *Institut français du pétrole* (IFP) and the *Bureau de recherches géologiques et minières* (BRGM) and in 1979 by the *Bureau pour le développement de la production agricole*. In 1991 the state marine research institute also joined the *groupement*. All six members are thus public sector organisations.

Prospace

Prospace was founded in 1974 for the promotion of the French space industry abroad, market research for space products and services and their commercialisation. The organisation has over fifty members and produces information and catalogues publicising the products and services offered. Prospace participates in conferences and trade fairs in order to promote the French space industry abroad.

Satel Conseil

Satel Conseil was founded in 1978 as an international consulting group covering the technical and commercial aspects of space communications. Its founder members were CNES, *Télévision de France* (TDF) and *France Câbles et Radio* (for *France Télécom*). The turnover of Satel Conseil first became significant in 1987, when the groupement's participation in the European satellite consulting organisation (GIE ESCO) involved it in important contracts, but in 1991 the turnover fell back from 13 million francs in 1990 (more than double 1989) to eleven million francs.

Overleaf we look at Sat Control.

Sat Control

Sat Control was created in January 1986 by CNES, Matra and Aérospatiale as an organisation specialising in satellite ground control stations. In 1989, with the rising importance of the Hermès programme for CNES and French industry, Sat Control's activities were directed more specifically towards the design of the Hermès ground control facilities.

Medes / IMPS

The *Institut de médecine et de physiologie spatiales* was set up in 1990 to encourage the development and commercialisation of space medecine expertise.

Scientific and technical GIEs and *Groupements d'intérêt public*

In addition to the commercial firms (*filiales*) and the commercially orientated GIEs, CNES is also involved in scientific and technical GIEs and *groupements d'intérêt public* (GIP) such as Cerfacs (research and advanced training in mathematical techniques), the CCVR (mathematical modelling), the *Observatoire des sciences et techniques* (OST), and GIP Ultrasons.

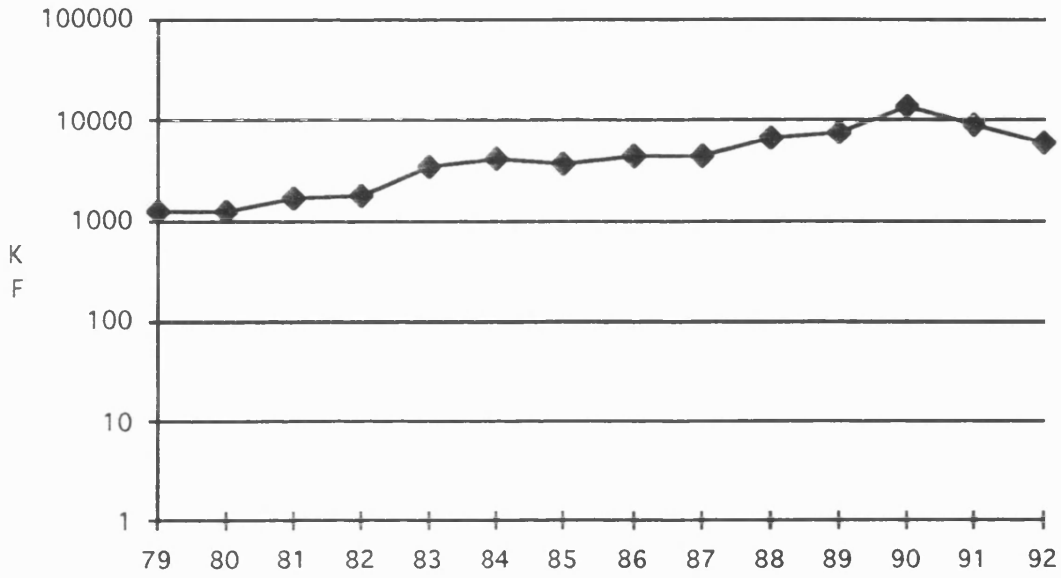
5.2.3. Economic impact of CNES activities

The CNES subsidiary companies, the various *Groupements d'intérêt économique* and *groupements d'intérêt scientifique* all represent the ambition of CNES during the 1980s to stimulate the French space industry through flexible and innovative business ventures. As part of what has become known as the CNES 'group', the subsidiaries and GIEs have also contributed to CNES's own financial stability through the 'own resources' which they have helped to accrue to the agency. As will be seen in the following section of this chapter which deals with CNES funding and budgets, the 'own resources' of the agency are small compared with the government grant which finances the great majority of CNES undertakings in research and development of programmes, in research and technology projects or in the funding of the running of the agency itself.

Taking all CNES activities and programmes together, and including the contributions to the French space industry which arise from ESA contracts, an

approximate measurement of the total financial impact of CNES on the French space sector can be derived. The graph below (constructed from CNES financial statistics) illustrates this total economic influence of CNES from 1979 to 1992.

Contracts signed with French industry 1979-1992



(Source : CNES Rapport Annuel 1992)

The graph shows how CNES activities and programmes contributed a steadily increasing number and value of contracts to French industry from 1979 to 1990, but that since 1990 the value of CNES contributions to industry has almost halved through the effects of world economic difficulties and the redefinition of ESA programmes such as Hermès.

CNES funding and budgets however have in the past tended to remain relatively unaffected by national or international economic difficulties, and it is to a consideration of how the agency is funded and at what levels that we now turn.

5.3. CNES Funding and Budgets.

The question of CNES funding and budgets provides a link between the missions assigned to the agency in its statutes and the organisation of its structures and activities. In this perspective the funding of CNES by the state represents the means of accomplishing objectives, and the CNES budgets reflect not only the importance accorded to these objectives by the state but also the agency's mix of

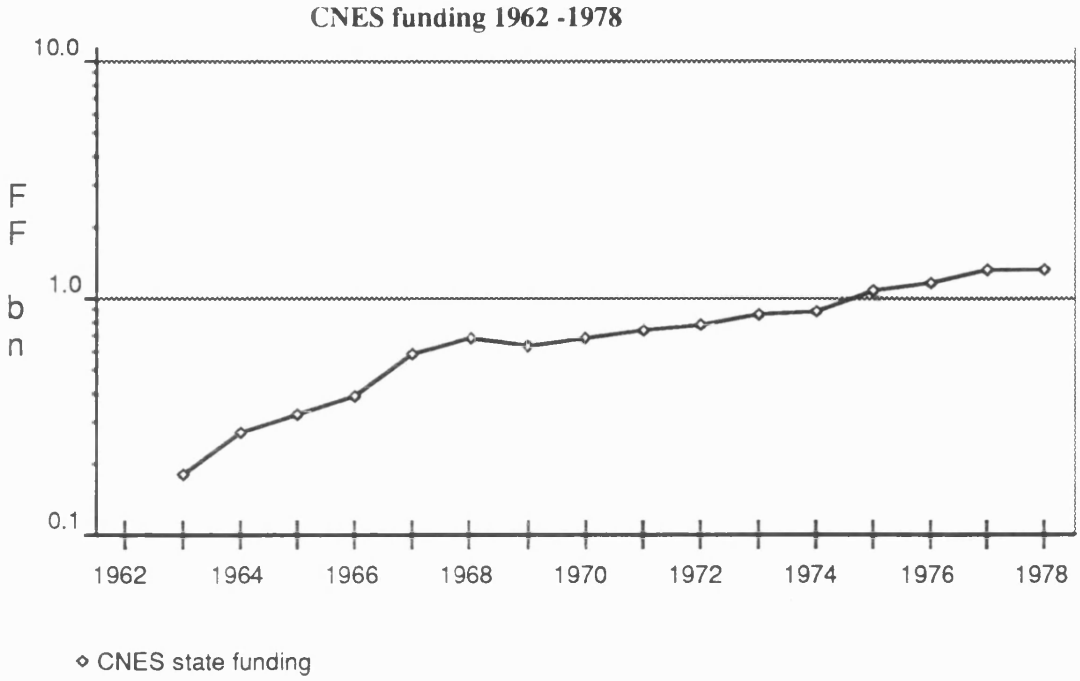
efforts to realise its missions. In addition, as a semi-autonomous institution, CNES may set itself other objectives to be fulfilled within the funding given by the state or by recourse to finance from the Centre's own resources.

It is not our aim to give a detailed accounting analysis of the financial performance of CNES as a budgetary organisation. The focus of attention here is rather the gross levels of funding made available to CNES through state grants, and the distribution made by CNES of these credits to different activities within the space sector. This quantitative approach also implies a more qualitative line of enquiry to the extent that the different sources of funding for CNES activities and the modalities of their payment are worth examination.

In order to place the finances of CNES during the 1980s within their historical context, we shall first briefly present the trends in funding over the period 1963-1978, before looking in more detail at funding and budgets for 1979-1989, and finally comparing French national funding for space with that of other countries.

5.3.1. Funding 1963-1978.[16]

1963 was the first full year of CNES'Sss existence as an operational budgetary entity, and its total initial funding amounted to some 180 million Francs, of which 6.7 million were destined for the setting up and running of the agency (at that time very small), and the rest for the immediate preparation of national and multilateral programmes. By 1978, total funding had risen after fifteen years to 1415 million Francs with running expenses representing 191.6 million Francs and programmes 1130 million Francs. Translated into constant 1981 figures, these levels of funding give a near threefold overall increase from 717.1 million Francs to 2051.6 million Francs. In terms of trends, the running expenses of the agency reached a peak in the early- to mid-1970s concurrent with the expansion of CNES activities concerning the original European space organisations and subsequently the ESA. This period also marked a rise in the funding set aside for multilateral cooperation, which had grown more slowly than that for national and bilateral programmes during the 1960s. Indeed, these programmes reached their peak in 1968 (at 1458.9 million F), falling to their lowest level of 306.7 million in 1978. After 1978, this situation was reversed, with an increase in funding for national and bilateral activities and an initial fall in contributions to ESA programmes.



(Compiled from Les enjeux de l'espace, La Documentation française, 1982)[17]

5.3.2. Funding and budgets 1979-1992

1979 saw a redefinition of CNES activities characterised by the operational status of the Ariane programme. From 1980 the CNES budget was financed from the following sources: a state grant; contributions from Ministries involved in certain CNES programmes, and, finally, the agency's 'own resources'. In 1979, total state funding for CNES amounted to 2,002 million F (1981 base), increasing in 1980 to 2,754 million F before falling again to 2 240 million F in 1981. From this basis, CNES funding and spending in the 1980s rose constantly, apart from a slight hesitation in 1984-85, to reach the 1989 level of 6,453 million F, and 7,187 million francs in 1990. These figures are comparable with the civil budget of the Atomic Energy Commissariat (CEA - in some ways a sister-institution to CNES) which reached a similar level, (6,903 million F), in 1988 and a planned budget of 6,284 million francs for 1990.[18] In 1990, 1991 and 1992, the state grant for CNES increased rapidly to 7.2 billion francs, to 8.1 bn francs and then to 8.6 bn francs under the influence of increased spending required on European programmes.

The state grant comes from the agency's '*Ministères de tutelle*' themselves dependent on the Finance and Budget Ministry's decisions on public spending for the year in question. Although these controlling authorities have changed from Ministry to ministry over the years, the typical situation is for finance for CNES to come in two parts, in accord with the concept of dual *tutelle.* Thus during the 1980s CNES's operating costs were often covered by a grant from the Ministry in

charge of Research/Science and Technology. This money is termed the *'subvention de fonctionnement'* (operating costs) and is relatively minor in importance compared with the *'subvention d'investissement'* (investment grant) typically (in the mid-1980s) transmitted to CNES through the *'budget annexe'* of the PTT Ministry. In 1979 the funding Ministries were Industry for the investment subsidy, and the *Secrétariat d'Etat à la Recherche* for the agency's operating costs, whereas in 1980 both operating and investment funding came from André Giraud's Industry Ministry (1924.4 million F). In 1988 and 1989 and 1990 the situation had changed to reflect the evolution of ministerial portfolios and the development of the space sector, with state providing the operating costs directly and the Ministry of Posts, Telecommunications and Space transmitting the *subvention d'investissement* directly to the agency. The table below summarises the sources of the CNES state grant during the 1980s and early 1990s.

Funding Ministries for CNES state grant 1980 - 1992

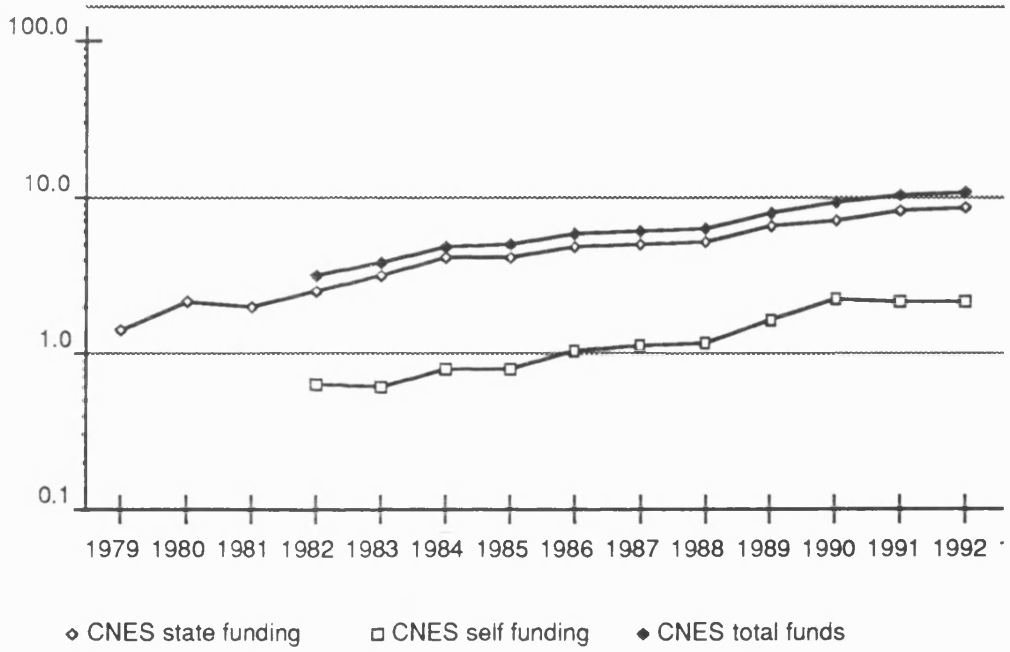
Year	Operating costs grant	Investment subsidy grant
1980	*Ministère de l'Industrie*	*Ministère de l'Industrie*
1981	*Ministère de la Recherche et de la Technologie*	*Ministère de la Recherche et de la Technologie*
1982	*Ministère de l'Industrie et de la Recherche*	*Ministère de l'Industrie et de la Recherche*
1983	*Ministère de l'Industrie et de la Recherche*	*Ministère de l'Industrie et de la Recherche*
1984	*Ministère de l'Industrie et de la Recherche*	*Ministère de l'Industrie et de la Recherche*
1985	*Ministère de la Recherche et de la Technologie*	*Budget annexe des PTT*
1986	*Direct from state*	*Budget annexe des PTT*
1987	*Ministère de l'Education nationale/Recherche*	*Budget annexe des PTT*
1988	*Direct from state*	*Budget annexe des PTT*
1989	*Direct from state*	*Ministère des Postes, Télécommunications et de l'Espace*
1990	*Direct from state*	*Ministère des Postes, Télécommunications et de l'Espace*
1991	*Direct from state*	*Ministère des Postes, Télécommunications et de l'Espace*
1992	*Direct from state*	*Ministère de l'Equipement, du Logement, des Transports, et de l'Espace*

Over the 1980s the increasing revenues accrueing to CNES as a result of its operational applications programmes (often run by CNES subsidiaries or '*filiales*') have allowed a progressive increase in the contribution made to the budget from CNES 'own resources'. The Ministries which contribute to the CNES budget because they have an interest in specific programmes run by the agency obviously vary with the programmes current at any time and the stage of development that the relevant programmes have reached. In 1980 for example other Ministries interested in the SPOT and Ariane programmes added 211.1 million F to the direct state funding, and a further 345 million F came from CNES own funds to make up the total budget of 2513.6 million F. The 1981 budget was very similar in terms of overall levels of funding to those of 1979 and 1980 at 2537.7 million Francs, but differed to the extent that the tax régime to which CNES was subjected was modified, making the '*subvention d'exploitation*' liable to VAT. This was still the case in 1989/90 but another reform of the tax/budgetary status of CNES is under way, namely the abolition of the *'gymnastique budgétaire assez complexe'*[19] of the funding for CNES transiting through the PTT '*budget annexe*'. This 'rebudgetisation' of funding for space (the trick of the 'budget annexe' is to take its contents outside the overall spending restrictions of public expenditure in yearly Budgets) marks a new phase in the development of the space sector as defined by the financial relationship between CNES and the state.[20]

From the levels mentioned in the above paragraphs, overall funding for CNES has risen steadily in the period 1979-1989/90 as it did over the 1960s and 1970s. Examination of the annual CNES budgets show how this funding has been attributed to different activities, and the changes in the proportions of the overall budget accorded to the various activities gives an indication of the changing priorities of the agency. The standard budgetary categories used by CNES are: I - Multilateral cooperation; II - Bilateral cooperation; III - National programmes; IV - Programme support, and V - General operating expenses. A number of remarks are apposite concerning the trends in the funds attributed to these activities. Firstly, French contributions to the 'multilateral' European Space Agency projects declined very early in the 1980s from the 60% of CNES's budget required by initial French leadership of the Ariane programme to a relatively stable 40%. This figure reflects the usual government authorisation for CNES to participate in European programmes up to 45% of their total cost. Secondly, the proportion of CNES funding devoted to bilateral projects with the two superpowers and with Germany is declining in recent budgets due to two factors; the high (and with *Hermès/Colombus/* Ariane V potentially rising) French commitments to ESA programmes since the Hague agreements of 1987, and secondly, the *'repli*

national' in applications programmes. This *'repli national'* - a fall-back on national programmes - can be explained either in terms of chauvinism and French desire for autonomy, or by the leadership of French industry in Europe. The general operating expenses finally, as an indication of the position of the agency itself in the space sector show a certain fluctuation over the ten-year period, reflecting the restructuring and reorganisation of the institution at different junctures in accord firstly with the redefinition of its missions and secondly with the changes in ministerial *tutelle*.

Funding 1979-1992 (bn FF)



(Source : *La Lettre du CNES*, CNES Annual Reports 1982-1992)[21]

5.3.3. French spending on space in international comparison

As mentioned in the Introduction, France prides herself on being the third space power in terms of the capabilities and the extent of her space sector. When French space budgets are compared with those of the superpowers there is a considerable discrepancy between the financial effort accorded by the United States and the former Soviet Union on the one hand and France on the other hand. To this extent at least it can be said that the French space programme is minor in importance. However, given the consideration that France is not really attempting to rival the space superpowers' technological and industrial prowess in any complete way (merely attempting to acquire a level of industrial/technological

proficiency and a variety of space services sufficient to afford a measure of independence), a more appropriate comparison is between France and the other countries in the second rank of space powers. Within the second rank there are three groups of countries : those involved in the European Space Agency's programmes, those in the developing world, and finally, in a group of its own, Japan. We shall consider France in comparison with the USA and USSR and then with its 'comparator' countries in the ESA.

USA and USSR

The 1992 budget of Nasa was $14.3bn, after an initial presidential request for $15.7bn. The Department of Defense space budget rose by a factor of five during the 1980s, reaching $19.2bn in 1991. This is obviously far in excess of what France could ever afford, even in combination with other European countries. As we have already shown in Chapter 4 in a consideration of space markets and sales, the European Commission estimated the 1991 US space industry turnover to be ten times that of all the EC countries combined.[22]

The space sector in the ex-USSR has been seriously affected by the political uncertainties of the Yeltsin period and was even threatened during the 1980s as Gorbatchev attempted to force the Soviet space effort towards 'profitability' and 'commercialisation' in the form of international cooperation and the sale of launcher facilities to the West. The reductions in spending for successive Five Year Space Plans in the late 1980s and early 1990s show how the space effort of America's great rival of the Cold War years is being reduced to more bearable proportions, since 22bn roubles have been assigned to the period 1991-95, in comparison with 32bn roubles for 1986-90. It is particularly difficult to distinguish between civil and military funding in the Soviet space effort, but despite an increasing weighting on civil applications, 55% of the budget in 1990 was devoted to military projects.

French comparisons of the importance of their space effort are invariably drawn with reference to the US and tend to work on two different levels of rhetoric. The first comparison to be drawn is often the favourable one that French spending on civil space as a percentage of GNP is close to that of the US, with the ESA average slightly lower. This establishes France's pre-eminence and conveniently hides the fact that in real figures, French national spending on space is low compared with US budgets. The second level of discourse however deals with this embarrassment by comparing total European funding of space with US funding. This is more flattering for Europe as a whole, and reflects prestige on

France as the prime mover within the European space effort. As the Rapport Loridant pointed out, Europe has gradually been decreasing the spending gap between itself and the US, and Nasa's 1991 budget was less than double ESA members total spending on space ($13.3bn for Nasa and $7bn ESA).[23]

Europe

The European Space Agency (ESA), created in 1975 from the remnants of the two previous European space organisations, namely the European Space Research Organisation (ESRO) and the European Launcher Development Organisation (ELDO) groups together 12 countries interested in the collaborative projects led by the ESA.[24]

Individual countries participate financially in ESA projects proportionately to the interest that the projects represent for them. Thus France has consistently contributed approximately 60% of the funding for the Ariane series of launch rockets and over 40% of Hermès costs, and significantly less, (10%), to the Columbus space station laboratory module which is deemed particularly important by Germany, who supplies 38% of the necessary funding. According to the ESA principle of *'juste retour'* (or 'fair return'), research and development contracts linked to a specific project awarded to national European space companies should reflect the overall contribution of their national government to the funding of the project. In this way the smaller countries who are less well provided with industrial infrastructures likely to be used in the development of projects still benefit from the stimulus of contracts to the value of their contributions. Conversely, in theory at least, French industry should not receive ESA contracts for Ariane in excess of French government contributions for the Ariane programme.[25]

France is the prime mover in the ESA and is the largest contributor to ESA cooperative projects. French contributions to ESA are greater in absolute and relative magnitude than those of Germany, her closest rival in the ESA, since given an initially higher rate of absolute funding, France's lower population and GNP imply proportionately higher investment in ESA space per capita and in terms of percentages of national wealth.

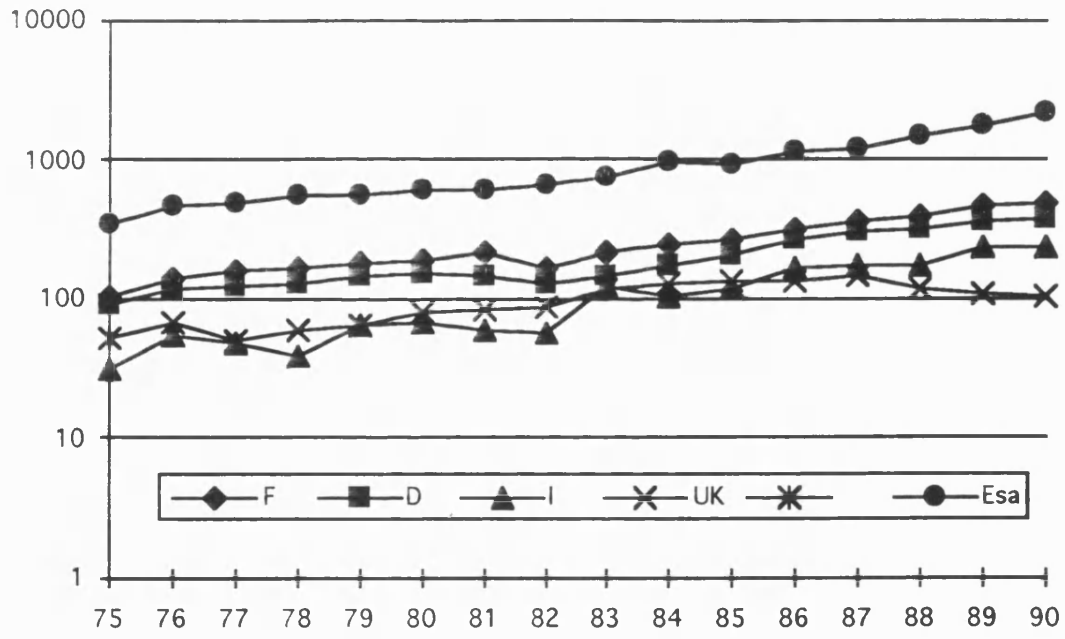
The table overleaf illustrates France's high per capita spending on space and the high proportion of GNP she devotes to the sector :

Space expenditure as % GNP and per capita (1991)		
	Space expenditure/GNP(%)	Expenditure/capita (US$)
France	0.0513	21.63
Germany	0.0203	10.34
UK	0.5290	3.6
USA	0.0340	116.1
Japan	0.0340	9.3

(Adapted from European Space Directory 1993)

The graph below shows how France has consistently been the largest contributor to ESA space activities in simple monetary terms.[26]

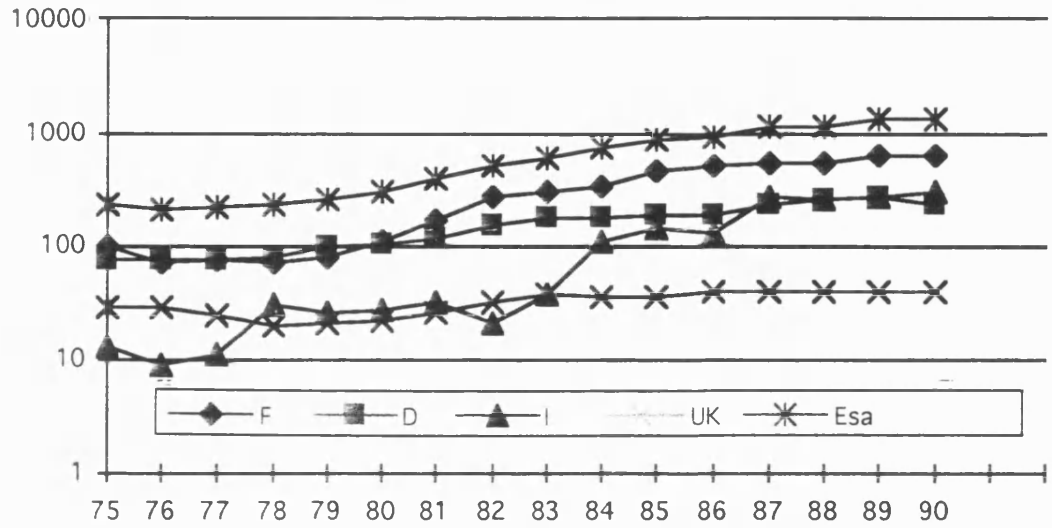
ESA member contributions 1975-1990 (MAU)



(Source : European Space Directory 1992 figures in current MAU)

As well as being the largest contributor to the ESA joint programmes, France is also the European country with the highest spending on purely national space projects. French national programmes are considerably more expensive than those of either Germany, Italy or the United Kingdom, as the graph overleaf illustrates.[27]

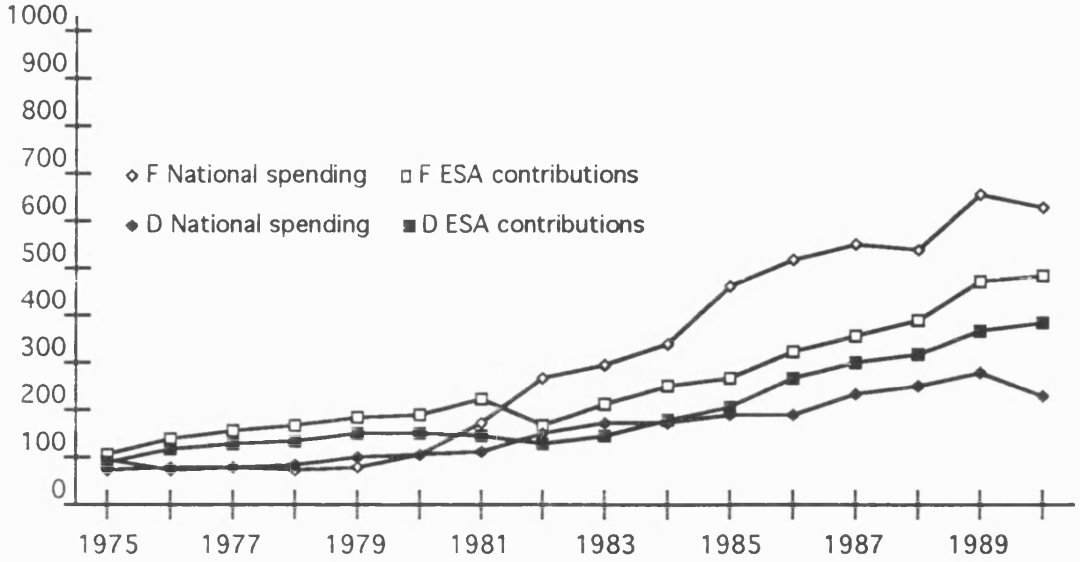
ESA national expenditures 1975-1990 (MAU)



(Source : European Space Directory 1992 figures in current MAU)

The comparison to be drawn between the French and German attitudes towards space is probably the most appropriate within Europe, to the extent that France and Germany were the main instigators of ESA and its collaborative projects and also that of the four major European countries involved in space, the French and German economies are closer in terms of scale and prosperity to each other than they are to those of Italy and the UK. If the figures for ESA contributions and national spending are put together, it becomes apparent that the French and German attitudes towards national and ESA space are somewhat different. Whilst contributions from each country to collaborative projects are relatively similar, it is also the case that French national spending on space, in addition to being higher than ESA contributions, also rose faster during the 1980s than French participation in ESA programmes. Germany's national spending, in contrast is not only lower than its ESA contributions but also fell during the same period in which French spending rose, as the following graph shows :

French and German Space Funding 1975-1990 (MAU)

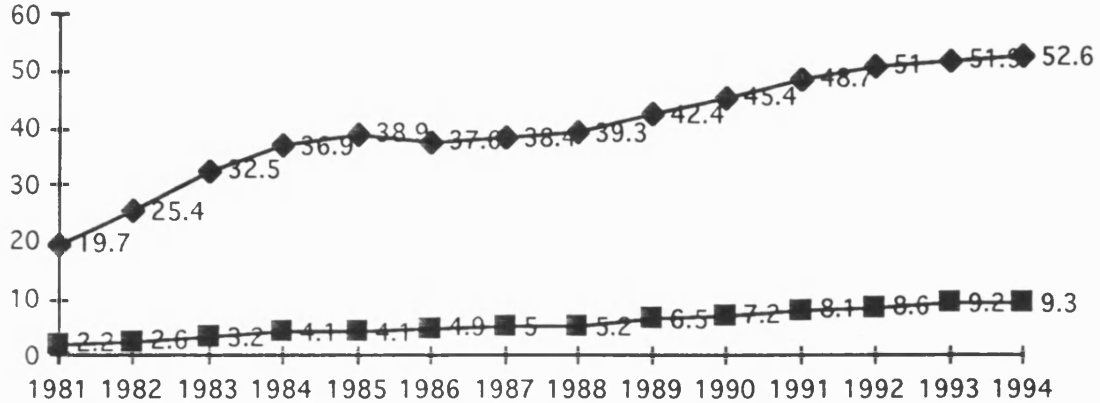


(Adapted from European Space Directory 1990 figures in current MAU)

5.3.4. French Space funding and other science and technology expenditure

As well as being apparently disproportionate to France's objective rank in the world and to the national means at her disposal for the conduct of space ventures, the French space effort represents a seemingly disproportionate percentage of French spending on scientific research and development. Thus in addition to having received continual increases in total funding from government over the thirty years of its existence, the budget of the French national space agency (CNES) now amounts to an increasing percentage of total state finance for civil research and development :

BCRD and CNES grant 1981-1994 (bn francs current)



(Source : Air et Cosmos, 8 June 1991, Le Monde, 24 March 1993, CNES Rapports)

Increases in funding for CNES have been greater than the growth in the BCRD overall as the following table suggests:

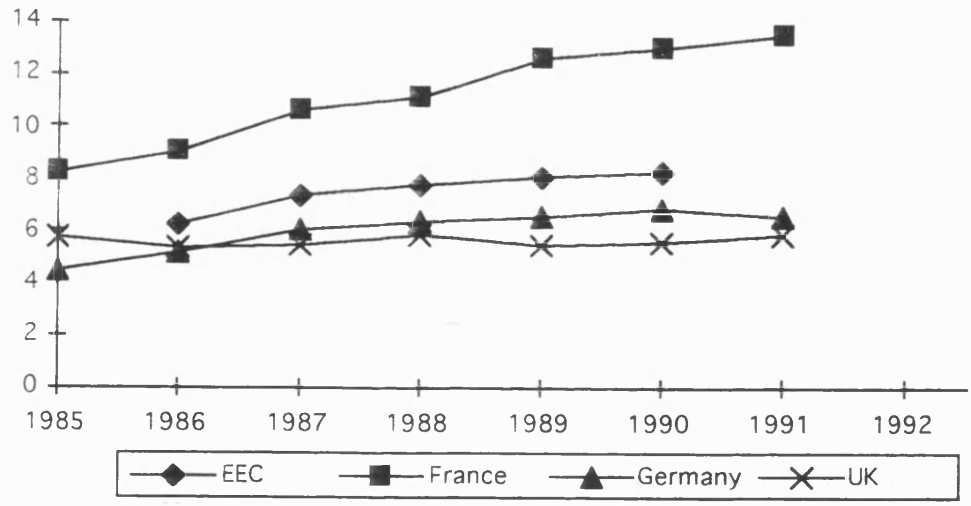
Real growth of BCRD 1987-1994

	1987	1988	1989	1990	1991	1992	1993	1994
% change in BCRD (adjusted figures)	-11.5	10.3	4.1	3.6	4.0	1.9	2.4	1.2

(Source : Air et Cosmos, 8 June 1991, Le Monde, 24 March 1993)

International comparisons can be drawn on the basis of simple OECD statistics on science and technology spending. These show that France spends proportionately appreciably more of the total civil funding for science and technology on space than other comparable nations :

Space programmes as % of civil GBAORD



(Source : adapted from OECD Science and Technology indicators)

5.4. Conclusion

This chapter has given an indication of the complexity of CNES's rôle, organisation, activities and funding as an *établissement public à caractère économique et commercial* entrusted by the French state with managing the space sector. If we start with the funding and budgets of the agency - the bottom line of the state's attitude towards its agent - we can conclude that spending on CNES and the space sector has been a significant component of overall public

expenditure on scientific research during the 1980s, and before. Similarly, in the light of the international comparisons we have drawn between French financial commitments to space and those of other European countries, the conclusion can be made that space is of particular importance in French science and technology. In terms of the levels of funding for CNES during the entire period of its existence, the constantly rising state grants evidence a strong belief on the part of government in the importance of CNES's activities.

These activities are, as we have shown, varied and complex, involving the agency in a large number of relatively disparate domains related to the encouragement and provision of space high-tech products, services and industrial facilities, as well as pure scientific and applied research. In a sense, the variety of CNES's interests, duties and initiatives in the space effort appears too great to afford government with a clear overview (or oversight) of the agency's undertakings. Since the current range of CNES undertakings is implied in the statutes of the agency as an EPIC and in the organisational structure for the agency that they prescribe, the implication is that some reform of CNES (or at least updating) is perhaps necessary. As was revealed in the discussion of CNES's 'hybrid' nature, the particular form of management of a sector and attainment of government-defined goals - *'gestion administrative décentralisée'* - embodied by the space agency can also foster difficulties between the state and its agent, specifically, problems of control. The rest of this section of the thesis is devoted to a detailed discussion of the relationship between CNES and the government ministries which deal with the agency either as users of space services or in the exercise of *tutelle*.

The following chapter examines the interaction between CNES and government through its links with the various Ministries involved in space activities during the period 1979-1988.

Notes to Chapter 5.

1 Loi No. 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales, Journal Officiel, 20 December 1961, pp.1165-66.

2 In fact, such uncertainties about the concept of the Epic have existed since much earlier, as the 1971 Conseil d'Etat Report revealed doubts over the 'incertitudes juridiques, financières et administratives' which Epics entail.

3 Loi no. 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales, article 2., alinéa 2, Journal Officiel de la République française, 20 décembre 1961, pp.11665-11666.

4 For the early period of CNES's existence, the best sources are DIELI/Ministère de l'Industrie, 20 Ans de conquête française de l'espace, 1981, and CNES, 25 Ans d'Espace en France, 1987.

5 For the precise composition in terms of personnalities of the CNES Board of Administration at any particular period, the Annual Reports present up to date lists, eg., the 1991 Rapport Annuel published in Summer 1992 gives the composition of the Board as at 30 April 1992.

6 The union representatives are usually elected on the CFDT-CDGT or CGT-UTG lists, and the main pressure group is *'Pour un nouvel essor spatial'*.

7 The presidency of CNES is an important and prestigious post - the president prior to Jacques-Louis Lions, Hubert Curien left to become Minister for Research and Technology.

8 The geographical spread of CNES activities shows how the space effort is a useful tool of government regional policy, perhaps the most extreme example of which is French Guyana, subsidies for which are acepted more willingly by the French taxpayer because of its satellite launch station.

9 This reputation is also based on expertise in aeronautics and electronics. A healthy rivalry is maintained betwen Toulouse and Bordeaux as the high-tech centre of the South West, Bordeaux basing its claim on the military space industry based around the regional military rocket testing areas.

10 Information based on interviews, press reporting and CNES Annual Reports.

11 *'Filière'* is a word which has increasingly replaced the Giscardian concept of a *'créneau'*, or market-niche to be occupied by high-tech firms. Roughly translateable as a network or 'chain' of developmental and industrial activities, the notion of *'filière'* expresses the vertical integration or continuity between different stages of the evolution of a single product.

12 CNES, Rapport Annuel, 1988, p.11, pp.48-52.

13 CNES, Rapport Annuel, 1988.

14 *'Le CNES, qui fédère l'effort national dans le domaine spatial, se doit de maintenir et de développer les savoir-faire et compétences de la communauté scientifique et de l'industrie. Dans ce but il entretient un ensemble de coopération avec la communauté industrielle. Mais il a également, à partir des acquis de la recherche et du développement de nouvelles technologies spatiales, suscité, quand c'était nécessaire, la création de structures industrielles et commerciales innovantes en relation avec d'autres partenaires financiers et industriels.'* CNES, Rapport Annuel 1991, p.61, 1992.

15 See OPECST Report, Expertise no.3, 'Observation de la Terre', pp.21-23.

16 Based on CNES Annual reports.

17 Funding 1963-82. Les Enjeux de l'Espace, La Doc. française, Sept 1982, p.96. (constant 1981 prices)

1963	717.1
1964	1037.5
1965	1192.5
1966	1394.5
1967	2062.7
1968	2327.2
1969	2010.8
1970	2068.0
1971	2106.8
1972	2091.7
1973	2182.3
1974	2043.4
1975	2177.6
1976	2042.6
1977	1994.0

1978	2051.6

18 Dufour, J.-F., Un coup de fouet pour la recherche industrielle, Le Monde, 17 September 1989.

19 As it was described ironically by Jacques Serris of the DGE. Interview, DGE, 28 June 1990.

20 Interview, Marc El Nouchi, *Direction du Budget*. 2 July 1990.

21 Funding 1982-1990. Source : La Lettre du CNES, CNES Annual Reports 1982-1989 Figures are for initial budgets in current prices.

	State grant	Own funds	Total
1979	2002.5		
1980	2754.7		
1981	2240.7		
1982	2545.5	635.6	3181.1
1983	3187.2	609.7	3796.9
1984	4108.8	848.1	4956.9
1985	4135.5	968.7	5104.2
1986	4847.5	1032.8	5880.3
1987	5022.1	1195.9	6218.0
1988	5217.9	1179.1	6397.0
1989	6453.0	1630.2	8083.2
1990	7186.9	2218.4	9405.3
1991	8118.8	2142.0	1026.0
1992	8598.6	2131.4	1073.0
1993			

22 See EC Commission, The European Community and space, Challenges, Opportunities and New actions (Com 92 360), p.11.

23 Expertise numéro 8, Enjeux économiques et industriels, p.23., OPECST, 1992.

24 France, Germany, Italy, United Kingdom, Spain, Belgium, Netherlands, Denmark, Norway, Sweden, Switzerland and Austria.

25 A 1988 study of the returns from ESA industrial contracts in ESA members showed that France received industrial contracts worth 84% of French government contributions to ESA, whereas Germany and Britain received only 69% and 59% respectively. Overall, over the period 1972-1987, 73% of contributions were translated into industrial activity in ESA countries, the rest being spent on work in non-agency countries or in the ESA's own research centres. See Returns from space agency low compared to payments, Financial Times, 13 July 1988, p.9.

26 ESA member contributions 1975-1990 (Million Accounting Units)

	79	80	81	82	83	84	85	86	87	88	89	90
F	184	191	220	165	212	250	268	323	358	388	473	486
D	148	152	147	129	146	175	203	268	299	319	368	385
I	66	68	60	58	124	103	118	167	174	172	232	240
UK	65	80	82	88	116	129	133	132	148	117	107	103
Tot. Esa	565	600	603	673	750	970	949	1151	1205	1509	1800	2174

(Source: adapted from European Space Directory 1990) In 1990, 1 AU = 1.047 US$.

27 ESA Member national expenditures 1975-1990 (Million Accounting units)

	79	80	81	82	83	84	85	86	87	88	89	90
F	78	107	172	266	297	339	462	516	552	539	655	626
D	99	106	113	151	173	173	187	190	235	251	279	229
I	26	28	32	21	38	108	145	131	271	258	279	308
UK	21	22	26	32	37	36	35	39	40	40	40	40
Tot. ESA	257	296	388	527	597	738	902	931	1154	115	1325	1349

(Source : adapted from European Space Directory 1990)

6. CNES and government 1979-1992 : a complex interaction

Chapter 5 showed the variety of scientific, industrial and commercial activities undertaken by CNES in fulfillment of its legally defined objective of helping define and leading French space policy. Here we will examine the interactions with government that these activities create for the space agency. In general terms we are looking at links between a 'Colbertist originated' state agency and the government 'user-partner ministries' with which it deals.

Analysing the nature and style of relationships between the space agency and those parts of government which are theoretically responsible for its actions reveals the complexity of the links between CNES as an EPIC and the state, and gives an indication of how the diversity of ministries involved in the *tutelle* of the space sector may create a fragmented pattern of responsibility and accountability.

Such a pattern of *tutelle* may encourage confusion in the overall production of space policy, and also, by emphasizing the agency's monopoly of expertise vis-à-vis government, may contribute to creating problems of power and control between the state and the sector leader. Examining the theory and practice of *tutelle* can indicate how the agency's statutes may need revision to reflect changing features of its activities, or how the activities of the agency and the way it contributes to policy formulation may necessitate reforms to be imposed by government in order to reassert government authority.

The laws, decrees and other texts defining the legal status of the *Centre national d'études spatiales* and the nature of its interactions with tutellary bodies are presented in the appendix to the thesis dealing with CNES statute documents. According to the famous maxims of the French public administration *'il n'y a pas de tutelle sans texte'* (no *tutelle* without a text) and *'un pouvoir de tutelle ne se présume point'* (*tutelle* can never be simply assumed), reference to statutes is often of crucial importance in following the development of the administrative status of agencies such as CNES.

The plan of the chapter is as follows :

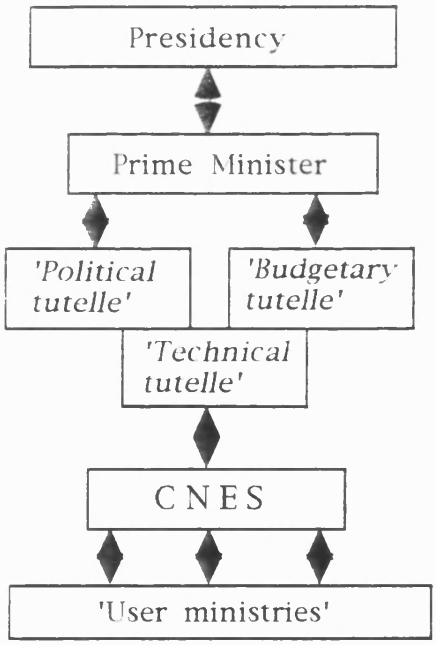
- **6.1.** CNES-State relations - theory and practice of *tutelle*
- **6.2.** CNES and the Industry and PTT Ministries
- **6.3.** CNES and the Research and Technology Ministries
- **6.4.** CNES and the Finance and Budget Ministry
- **6.5.** CNES and the Foreign Affairs Ministry
- **6.6.** Conclusion

6.1. CNES -state relations - theory and practice of *tutelle*

6.1.1. The theory of *tutelle*

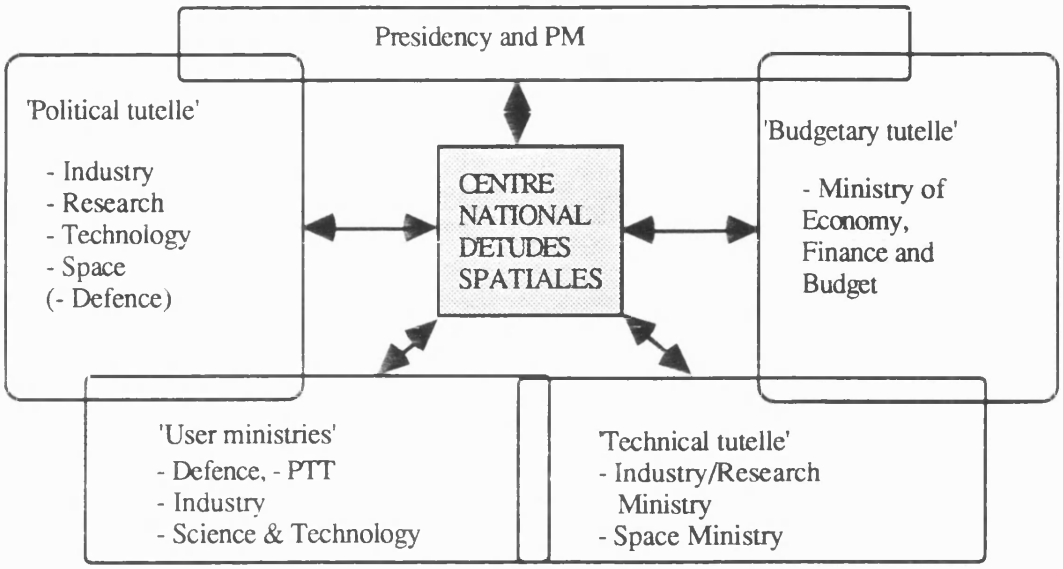
In theoretical terms, CNES interacts with government in five main ways. These five ways are firstly its interaction with those ministries that exercise political *tutelle*; secondly its interaction with those government entities which exercise budgetary *tutelle*; thirdly those ministries which implement measures of technical *tutelle*, fourthly, interaction with ministries who are users of space products or services; and fifthly, its interaction with the Prime Minister's office and the Presidency of the Republic in their rôle in the definition of overall space policy. The first diagram below gives a simplified representation of these relationships :

Theoretical interaction between CNES and government



These categories of interaction overlap somewhat, preventing a simple division of ministries and government bodies into 'users' on the one side and 'controllers' on the other. During the 1980s this overlap was increasingly perceived to be the source of inefficiencies in governments' interaction with CNES and the space sector, leading in 1988 to the creation of new, more suitable patterns of interaction and new forms of *tutelle*. The diagram below gives a better representation of these overlaps and of the complexities of CNES's relationship with government.

CNES and government



The differences between the theoretical model of interactions between CNES as a state agency and government and the real situation reside essentially in the way in which the simple pattern of agency-state interfacing has become complicated by the number of ministerial authorities involved in various ways in space activities. In the terminology of French administrative science, CNES as an EPIC is theoretically an example of *'décentralisation administrative'*, through which government empowers lower level bodies (by statute) to take and implement decisions in a particular field. The process of *'décentralisation'* is balanced by *'surveillance'* and *'contrôle'* exercised by government in order to ensure that the autonomy of agencies is not abused.[1] Oversight and 'control' of agency activities is essentially effected through *tutelle* by the ministry or ministries responsible for the EPIC, but clearly, the more complicated the pattern of *tutelle*, the greater the potential for confusion.

The partial 'clarification' of *tutelle* which took place during the late 1980s and early 1990s will be examined in Chapter 7, after we have here analysed the ways in which CNES interacted with government ministries during the period 1979-1988/89.

6.1.2. Practice : changing *tutelle*

The ambiguity in nature of relationships between CNES and the various ministries with which it interacts seems to encourage a certain fluidity in the patterns of ministerial authority over the agency, since *tutelle* has tended to change quite frequently during the 1980s and early 1990s. The variability of *tutelle* is doubtless

a function partly of changes in government, but is principally determined by government perceptions of the 'nature' of space activities during a given period. Thus the 1960s were marked by the attribution of authority for CNES to Ministers and Secretaries of State for Scientific research and Atomic and Space questions, in reflection of the certainty that space was first and foremost the handservant of the developing deterrent force. In 1969 and during the 1970s, the potential importance of industrial aspects of space came to be increasingly realised, resulting in the somewhat anticipatory transfer of the brief for CNES to various successive Ministries of Scientific and Industrial development, of Industry and Research, and simply of Industry. The 1979 launch of Ariane, (while CNES was under the *tutelle* of the Industry Ministry) ushered in what was expected to be the 'applications era', and by implication, a period in which CNES would be increasingly called upon to interact industrially and commercially with an increasing variety of 'user ministries'. However, under the Socialists, perhaps in reaction to this 'industrial' treatment of a field considered traditionally to require more than the mere interplay of market forces to yield its full value for France, the early 1980s firstly saw the *tutelle* for CNES being placed with Jean-Pierre Chevènement's 'Super Ministry' of Research and Technology, before witnessing a move towards a reintegration of science/technology with industry in a subsequent Ministry of Industry and Research, which again assumed responsibility for the space agency. After the separation of Industry and Research following the departure of Minister Laurent Fabius to Matignon in 1984, Research and Technology and CNES *tutelle* were reunited under Hubert Curien, and the Industry portfolio was transformed into Industrial Redeployment and Overseas Trade. This situation lasted until the first period of *Cohabitation* during which Research was subsumed within the Ministry of Education (as the responsibility of the Minister in charge of Higher Education), and Industry was joined with the PTT and Tourism, although still exercising main responsibiliy for CNES. Only in 1988 did any real attempt to properly rationalise the pattern of *tutelle* for CNES become evident with the creation of the *Ministère des Postes, Télécommunications et de l'Espace*, thereby giving CNES a 'Space' Minister for the first time since the 1950s and 1960s.

The table overleaf shows the succession of ministries which exercised political responsibility for CNES during the period 1980 - 1993.

CNES *Tutelle* 1980-1993	
	Principal *Tutelle*
1980 - May 1981	*Ministère de l'Industrie*
May 1981 - June 1982	*Ministère de la Recherche et de la Technologie*
July 1983 - June 1984	*Ministère de l'Industrie et de la Recherche*
July 1984 - March 1986	*Ministère de la Recherche et de la Technologie*
March 1986 - April 1988	*Ministère de l'Industrie, des P.T.T. et du Tourisme/ Ministère de l'Education nationale*
May 1988 - May 1991	*Ministère des Postes, Télécommunications et Espace (MPTE)/ Ministère de la Recherche et de la Technologie*
May 1991 - April 1992	*Ministère de l'Equipement, du Logement, des Transports et de l'Espace/ MRT*
April 1992 - March 1993	*Ministère de la Recherche et de l'Espace*

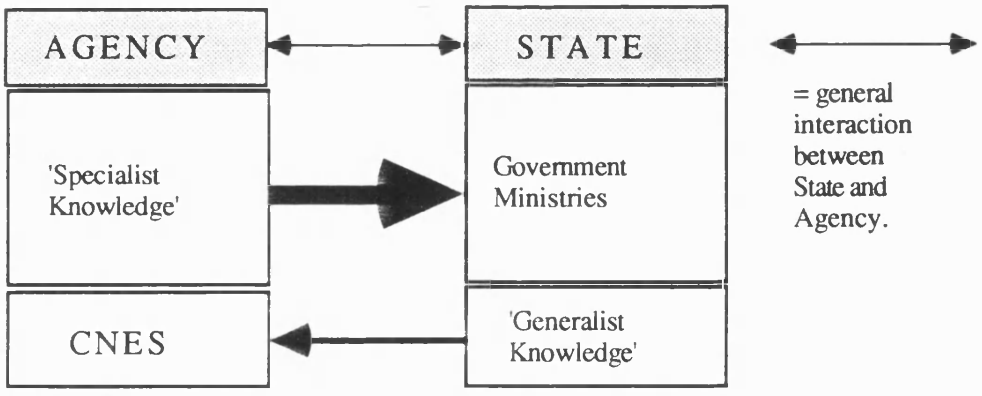
This game of musical chairs played with what might be termed the space portfolio during the greater part of the 1980s was caused by a number of factors, some of which were narrowly political, some of which had deeper ideological justifications and some of which had an economic or organisational inspiration. The narrowly political influences are exemplified by such phenomena as infighting within the government of the day or within the Socialist Party for the attribution of what were seen as prestige responsibilities. For example, to a certain extent, Chevènement's appointment to head a 'super Ministry' was as much determined by personal motives and by the desire on behalf of the Socialist Party to placate or reward his left-wing CERES tendency as by prevailing Socialist Party thinking on the 'ideology' of science and technology and 'objective' considerations of organisational and administrative efficiency. Similarly, the transfer in 1986 of the responsibility for space matters from Alain Devaquet's Research and Technology Ministry (*Secrétariat d'Etat*) to become part of Alain Madelin's Industry Ministry was a consequence of Devaquet's weakness in defending his case for retaining his brief rather than by an overriding logic in favour of the change.[2] Arguably only in 1988 were modifications made to the pattern of *tutelle* which were truly motivated by a desire to clarify the situation in the space sector and to rationalise the administrative and financial interaction between CNES and the state.

In abstract terms of administrative science, following CNES's status in administrative hierarchies, CNES's links with government, controlling ministries and user ministries should exhibit a pattern of exercise of authority by the state over its (semi-autonomous) scientific-technological/industrial-commercial agency.

But the theoretical independence of the agency as an *Etablissement public à caractère industriel et commercial* establishes the possibility for CNES to try to impose its own orientation on government (it is after all entrusted with the responsibility of proposing space policy to government) despite the fact that the ultimate control of funding remains (theoretically) with the Finance and Budget Ministry and ultimate political authority with the Prime Minister and President. We have seen one indication of CNES's 'room for manoeuvre' in the composition of its *Conseil d'administration,* which gives the agency a built in majority over government representatives. (Another feature which contributes to some measure of financial independence is CNES's involvement in ventures such as the *filiales* and GIEs, which brings the agency 'own funds').

The degree of equilibrium between autonomy of action and dependency enjoyed by CNES is essentially a function of the two characteristic features of the management of the space sector. Firstly, given that CNES is accepted as the prime mover in the exercise of the space programme, institutionally, its links with government are determined by the question of 'expertise' : if CNES is the sole repository of competence on space activities its independence of action vis-à-vis government is increased. If on the other hand CNES expertise can be challenged by objective evaluations from other areas, then the practical consequences of CNES's autonomy of proposition and of action are restricted.

The problem of 'expertise' in state-agency relationships



The second feature is the degree of political/financial autonomy enjoyed by CNES. As set out in the section on CNES budgets and spending activites, the space agency is funded through the MPTE Ministry budget and through the Research /MRT Ministry, as well as having a small amount of 'own funding' at its disposal derived from services rendered to 'user ministries' or to other organisations (CNES *'filiales'* operate on a commercial footing).[3]

Without delving unduly into explanations of the power of Military-industrial or Scientific-technical complexes and lobbies, nor examining contemporary society as a '*système technicien*' we can still consider the oft-repeated (and rarely challenged) opinion that CNES exercises an influence disproportionate even to its ambiguous institutional status. In this view CNES engineers and administrators represent a 'mafia' of contacts throughout the space and related scientific and industrial sectors. This organisational lobby of personnel is underpinned by the 'favoured activity' aspect of the space programme, making the state doubtless more tolerant of the corporatist tendencies of space employees. The corporatist tendencies of space-employed individuals express themselves in pressure groups within the space centre and industry, for example the list for the election of CNES employees to the Board of Administration *'Pour un nouvel essor spatial'*, or through the network of highly trained and highly placed space engineers and administrators throughout the 'technostructure'. [4]

Our ambition here is not to study in detail either foreign, industrial or economic policy as they impinge on the development of the space sector; such more restricted studies could well follow this broader analysis of the fundamental structures of the making of space policy. Here, the broad trends of French foreign, defence and industry policy and of macroeconomic management have to be taken as 'given' and representing the background to the evolution of the space sector (science and technology, defence and industry).

We shall first address the relationship between the Industry portfolio and space, since the responsibility for space during the early 1980s rested principally with Industry ministries of varying form. We shall then analyse how Science and Technology ministries became increasingly involved in the space sector in the late 1980s, before concluding the chapter with brief studies of the links between the Finance and Foreign Affairs Ministries and CNES. In Chapter 7 we shall go on to examine how the somewhat confused pattern of interaction between CNES and its 'master-partner-user' ministries was changed in the late-1980s by the creation of a 'Space Ministry' which exercised *tutelle* jointly with the Ministry of Research and Technology.

6.2. CNES and the Industry and PTT Ministries

The Industry Ministry (often containing the PTT Ministry) has traditionally featured as one of the regulating ministries for CNES activities, along with the Science and Research ministries (and the Economics, Finance and Budget Ministry). During

some periods, the Science and Industry Ministries have been merged and *tutelle* for these two different elements of CNES activities has originated from a single source. In the later 1980s, Industry Ministry intervention in CNES affairs was more limited, being essentially restricted to the exercise of a monitoring rôle on the CNES Board of Administration effected by the representative of the *Direction des industries éléctroniques et de l'informatique* (DIELI), and by the encouragement of a small number of industrial activities undertaken by space sector firms by the *Service des industries de commerce et de services* (SERICS).[5]

6.2.1. The Industry Ministry

However, during the early and mid-1980s, responsibility for space rested with the Industry Ministry. The changes to CNES statutes brought in by the decree of 14 June 1979 which dealt with the organisation and functioning of CNES (not addressing the question of space research as such), originated from the then Industry Ministry (under André Giraud, who later presided as Defence Minister over the relaunch of French military space in 1986/87). With the objective of preparing CNES for the applications era, the modifications defined the CNES *Conseil d'administration* for the first time exclusively in terms of the *'corps d'origine'* of its members, thus emphasizing the variety of ministerial and other interests in space. In addition to five members nominated by the Industry Ministry because of their expertise in various aspects of the Centre's activities (Meteorology etc), the Council was to be composed of the Director of the Budget (Budget Ministry), the *Directeur des affaires industrielles et internationales* at the *Secrétariat d'Etat aux Postes et aux Télécommunications*, the head of the *Direction technique des Engins* (Ministry of Defence), the *Secrétaire Général de la Défense nationale,* the Director General of *Télédiffusion de France* (TDF), the Director General of Cultural, Scientific and Technical Relations at the Foreign Affairs Ministry, the Director of the DGRST, and the head of the External Economic Relations at the Finance Ministry.[6] This composition of the Council held more or less for the period of the 1980s, representing as it did the ministerial interests implicated in this particular stage of the space sector's evolution towards technological, organisational, industrial and financial 'maturity'/'autonomy'.

The Ministry of Industry (and Research) was again instrumental in changing CNES's organisation when in 1984 the CNES statutes were 'brought up to date' through decree no. 84-510 of June 28.[7] In abrogating the decrees 76-104, 77-977 and 79-468, and by reference to the law 82-610 concerning the *Recherche et développement technologique de la France*, this updating of the

organisation of CNES translated the new Socialist administration's view on such large state technico-industrial institutions, namely that high technology should contribute positively to France's continuing industrial and social modernisation.[8]

Under the Industry Ministry in the early and mid-1980s the brief of the *Conseil d'administration* remained largely unchanged from the 1970s, with the same freedom of action for the governing body of the space Centre relative to the approval or veto of the ministries entrusted with *tutelle* for CNES, or of the government Commissar. Thus in 1984, *Conseil d'administration* decisions concerning annual income (expenditure forecasts, balance sheets, borrowing, prefinancing of projects, financial participations in other businesses and recruitment) were all effective *unless challenged* by the Ministries of Industry and Research, or of the Economy, Finances and Budget.[9] The government Commissar supervised the other activities and organisation of the Centre, including the production of the annual report, the negotiation of contracts, conventions and *'marchés'* and the international relations aspects of CNES activities. Any opposition to these responsibilities and decisions of the CNES administration by the Commissar led to the notification of the government Ministry concerned.

The *Commissaire du gouvernement* was seconded in this supervisory rôle by the *Contrôleur d'Etat,* responsible also for the financial organisation of the Centre's activities and appointed by the Budget Ministry.[10] This 'political' supervision was not noticeably modified in 1984 from the dispositions already adopted in the 1970s. The 1984 update also included the reaffirmation of the advisory rôle of the *Comité des programmes scientifiques*, but, perhaps significantly, the opportunity was not taken to reestablish the *Conseil des applications spatiales* in either its previous or a modernised form.[11]

6.2.2. Ministries of Industrial redeployment, Industry and the PTT

After the three Mauroy governments between 1981 and 1984, the Fabius government appointed in July 1984 (and reshuffled in December 1984 and May 1985) bequeathed to the right-wing Chirac period a situation in which responsibility for space had been split unequally between the Research and Technology Ministry under Hubert Curien, who exercised the main authority over CNES, and the Ministry of Industrial Redeployment and Overseas Trade (Edith Cresson), within which served Louis Mexandeau as Delegate Minister in charge of PTT. Under *cohabitation*, main responsibility for space was restored to the Industry Ministry.

The 1986 change of government and the following period of *cohabitation* brought about a relatively minor transformation of the CNES statutes but which is nevertheless of interest to our study in the way it revealed prevailing patterns in the state/space sector interface. Two decrees promulgated in April 1986 defined the attributions of the Industry, PTT and Tourism Ministry under Alain Madelin and those of the *Ministère de l'Education Nationale* headed by René Monory, again sharing responsibility for CNES between them.[12] Jointly, these two ministries also exercised the *tutelle* of other EPICs such as the *Agence nationale pour la valorisation de la recherche* (ANVAR), the *Agence française pour la maîtrise de l'énergie* and the *Cité des Sciences et de l'Industrie* (National Science Museum). Within the Ministry of National Education, only minor responsibility for space questions was held by the *Ministre délégué* for Research and Higher education, Alain Devaquet, acting as he was in collaboration with a 'full' and powerful Ministry in the form of Madelin's Industry, PTT and Tourism which exercised the other, more major elements of CNES *tutelle*[13] .

It might be suggested that placing CNES activities essentially under the aegis of the Industry Ministry reflected the supposedly 'liberal' industrial creed of the Chirac administration in that space activities were to be seen as a free-market, industrially and commercially orientated sector rather than as a problem for debate in terms of massive state funding through government research and technology budgets. This was definitely the general 'ideological rationale' of the Industry Minister and doubtless he hoped that space might respond to this style of thinking in the same way that the 'liberal' ideology of the economics of scientific research maintained that research funded by industry (and not by the state) was the most cost-effective.[14] The subsequent perennity of more or less traditional attitudes towards the French space effort by the Chirac government would tend to imply that any intention to streamline the space effort along drastically liberal economic lines was abandoned as the Chirac government became aware of the power both of the CNES lobby within the Establishment and of the prestige value of a strong, government-led space sector.[15]

This situation was thus codified by the decrees 86-714 and 86-715[16]. Article 2.3 of 86-715, which stated that the Industry, PTT and Tourism Ministry gives '*les impulsions nécessaires au développement par les entreprises d'une politique d'innovation et d'amélioration de leur compétitivité*' reveals the perspective taken towards science and technology by the Industry Ministry. Before the end of *Cohabitation*, the organisation of responsibility for space varied little, control of the PTT being hived off from Industry in late 1986 under Gérard Longuet, and

Devaquet being replaced by Jacques Valade at Research and Higher Education in early 1987.[17]

During the 1980s, much of the interaction between the Industry Ministry in its differing forms and CNES was through the organisations attached to the Industry Ministry which were interested in fields of applications provided by CNES expertise. On a relatively low level the *Institut français du pétrole* (IFP), and the *Bureau des recherches géologiques et minières* (BRGM) liaised with CNES for obvious reasons of satellite observation detection of mineral and fossile fuel resources. More importantly, on the level of satellite telecommunications applications, *Télédiffusion de France* (TDF) and the *Direction Générale des Télécommunications* (DGT) cooperated closely with CNES in the definition of the specifications for telecom and broadcasting satellites. Ministerially, the Industry and Telecoms portfolios have often been grouped together, as we have seen, for example during 1985, 1986 and 1987, usually because of the industrial importance of large telecommunications programmes. Because of CNES's collaboration with TDF and the DGT on satellite broadcasting and telecommunications, the *tutelle* over CNES of the Industry Ministry (to which the PTTs were attached) was often a logical step.[18]

The Industry Ministry saw space as a diffuse but nevertheless priority area for high-tech development. The close and considerable links between the MRT and CNES and more recently between the MPTE/DGE and the space agency mean that Industry Ministers are decreasingly involved in space policy and in the space effort, the industrial aspects of the policy and its implementation being produced by the industrial fabric of the space sector, itself public or para-public for the most part and stimulated not by the Industry Ministry but by the MRT/MPTE/CNES conglomerate, as well, of course by the DGA.[19]

It is to a consideration of the involvement of Science, Research and Technology Ministries in the development of overall space policy that we now turn.

6.3. CNES and the Research and Technology Ministries

Although in April 1992 the *tutelle* of CNES became the *sole* responsibility of the *Ministère de la Recherche et de l'Espace* (MRE), as we have seen authority over the agency was essentially shared during the 1980s between Industry and Research (sometimes combined in a single ministry). In the period immediately preceeding the change of President and government in May 1981, CNES was

under the authority of the Industry Ministry, but the new Socialist administration's desire to stress France's scientific and technological development led to the agency first becoming part of the responsibility of Jean-Pierre Chevènement's 'super-Ministry' of Research and Technology. In July 1983 the *tutelle* for CNES moved to the newly-created Ministry of Industry and Research, under Laurent Fabius, only to be moved again a year later to another newly-formed Ministry of Research and Technology led by the former president of CNES, Hubert Curien.

Under Curien CNES consolidated its position from July 1984 - March 1986, naturally enjoying the favourable relationship that existed between the agency and its controlling minister. It is a significant indication of the privileged rapport between government and the EPIC during this time that the period saw the ratification of CNES's involvement in the major European Space Agency programmes such as Ariane V, and Columbus which were decided at the ESA summit in Rome in 1985, and also, France's strong interest in planning the Hermès space plane. Although Hermès was actually accepted for 'Europeanisation' by the ESA in June 1986 under the Chirac government, the major effort of finalising specifications and negotiations was undertaken by CNES and Curien's Research and Technology Ministry.

During cohabitation, CNES was supervised mainly by the Industry, PTT and Tourism Ministry assisted by Research and Higher Education, before returning to joint *tutelle* in 1988. Between May 1988 and May 1991 CNES was overseen jointly by the Ministry of Posts, Telecommunications and Space (MPTE), *and* by the Ministry of Research and Technology (MRT) headed again by Hubert Curien. 1988 saw the first real attempt to rationalise *tutelle* for the space sector with the creation of the MPTE and the MRT. In the following paragraphs we will examine the relationship between Research and Technology and CNES at the end of the 1980s in the form of the MRT. (The MPTE is the subject of analysis in chapter 7)

6.3.1. The Ministry of Research and Technology (1988 - 91)

In 1989 the organisational chart of the MRT was redrawn in accordance with the wish of Hubert Curien to streamline the activities of the Ministry. As expressed in the review *La Recherche*, Curien's objectives seemed a little contradictory, since he stated that the Ministry should be involved as little as possible in management, develop technical expertise and ensure the efficient *tutelle* of research institutions (such as CNES).[20] The ambition to reduce the importance of the 'management' rôle of the Ministry seems to cohabit with difficulty with the exercise of *tutelle* over

the research institutions, and the need to possess technical expertise itself would seem to go against the possibility of streamlining the Ministry.

However, the project to reform the Ministry was part of the overall project to renovate the French public sector (*Plan de rénovation du secteur public*) in accord with the aim of 'modernisation'. As set out in a circular from the Prime Minister on 23 January 1989 the renovation was to be based on four main themes: firstly, a more dynamic management of public sector personnel; secondly, the encouragement of administrative and financial initiative; thirdly, improved service for public service '*usagers*' and fourthly the assessment (or '*évaluation*') of the efficacity of state intervention.[21] In terms of the relationship between the MRT and the space sector, this modernisation project resulted in the creation of a scientific and technical department within the MRT responsible for Earth Sciences, Oceanography, Space and Environmental Science.[22] Along with nine other specialised departments, *Terre, Océan, Espace, et Environnement* (TOEE) under the authority of the *Direction générale de la recherche et de la technologie* exercised the full range of tutellary duties for its sectors of responsibility and drew up budget proposals for research institutes.[23] This action was complemented by that of the parallel *Direction de l'administration et du financement de la recherche* which elaborated the Ministry's budgetary decisions and statute reforms.[24]

6.3.2. The special nature of space policy.

When considering the rôle of the MRT in relationship to specific sectors of science and technology, of which space and the TOEE is a special example, it should be kept in mind that the research and technology brief is singular to the extent that the actions of the Ministry and the advice and decisions it forwards to the scientific and technological community are followed by relatively long-term and distant consequences. The reform of the MRT was intended to increase its ability to follow (and assess and control) the actions of its sector. Comparing the MRT and the MPTE in 1989, the then *Directeur Général de la recherche et de la technologie* Didier Lombard stated his belief that the essential difference between the two tutor ministries of CNES lay in the relative 'immediacy' with which the effects of MPTE policies were perceived, whereas for the MRT and its dependent bodies such as CNES, effects were distant.[25] Lombard recognised that the ministerial authorities are to greater or lesser extents incapable of exercising complete control over the activities of the organisations over which they are theoretically deemed to implement *tutelle* and that there is consequently an 'indicative' quality to the *tutelle*.

This 'flexibility' of the relationship between the MRT and institutions which like CNES may be '*agences d'objectifs*' (or mission-agencies) in their own right was neatly expressed by M. Vidal-Madjar of the TOEE, who described the activities of his department as being *'une courroie de transmission intelligente'* between the different actors making up the space sector.[26] This image of a continuous drive belt to represent the interaction between the MRT and CNES is particularly appropriate because it translates the hierarchical ambiguity of the situation, namely that it is sometimes difficult to see just who is at the controls of the power belt and which direction it is going in. To deepen the metaphor, the 'intelligence' of the transmission represents the "give" in the mechanism afforded by the complicated nature of the MRT as theoretical *tutelle* and *de facto* partner. The ambiguity of the relationship is a function of the incompleteness of the chain of responsibility (in contrast with the MPTE, as Lombard implies, where results and mistakes are rapidly apparent). Essentially, depending on where one is placed within the CNES-MRT system, the initiative for undertaking measures and implementing decisions can vary between the two actors.[27]

This situation was reflected in the confusion about the precedence of either CNES or the MRT in negociations concerning state intervention in space activities. The popular opinion, fed by suspicion of the Scientific-military-industrial complex, was that the technical expertise and influence of CNES allowed it to 'manipulate' the Research and Technology Ministry. In May 1989 the *Directeur adjoint* of Curien's personal cabinet, Daniel Sacotte, was at pains to reject this view, affirming that the MRT was 'perfectly in charge' *'(parfaitement leader')* in budgetary discussions with CNES.[28] The justification for this affirmation of the primacy of political control over the influence of the space agency is based on the fact that since the CNES budget goes through the *Budget civil de recherche et de développement* (BCRD) managed by the MRT, CNES is thus necessarily subordinate. This essentially theoretical argument is perhaps less than totally satisfactory, omitting as it does consideration of 'extra-budgetary' pressures exerted by CNES throughout the space sector and government outside the precise framework of MRT-CNES funding negociations. Moreover, Sacotte's view, representing the official position of the Ministry (and thus necessarily stressing the authority of the establishment over its 'tributary' institutions) does not seem to be entirely shared by other officials, as interviews reveal.[29]

Indeed, both in CNES and within the Research and Technology Ministry itself, CNES's *'capacité de proposition'* (or rôle in suggesting itself projects and policy) is recognised as representing a considerable concession to CNES expertise and influence vis-à-vis its controlling authority. CNES's control of its scientific

programmes is a case in point : the funding from the MRT is used by CNES on the basis of its own evaluations of projects proposed by laboratories and research institutions and mediated by the MRT (*'mise en forme de demandes'*).[30] The cost of putting the experiments into space is assessed by CNES and they are then ranked in order of scientific merit, the projects actually selected being determined by the budget level for scientific programmes decided by CNES for the year in question.

After the period of the early 1980s, when the *tutelle* for CNES was variable and confused, complicated by the anticipated onset of the 'applications era' and by the new Socialist administration's ideas on science and technology, the end of cohabitation in 1988 and the Rocard government's ambitions to modernise and rationalise the state created the possibility for a reappraisal of CNES's relationship with its *tutelle*. During 1988, 1989 and 1990 and part of 1991, *tutelle* for the agency remained stable (between 1980 and 1986 *tutelle* changed five times) in the form of the MRT and the MPTE.

6.4. CNES and the Finance and Budget Ministry

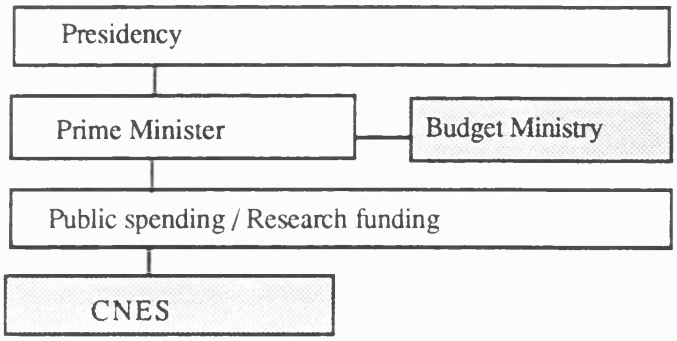
The budget level decided by CNES for any specific programme in any given year is to a certain extent a function of the overall funding attributed to the agency by government for the year in question, flexibility being retained by calling on the agency's "own funds".[31] The channels through which this *'dotation budgétaire'* is transmitted to CNES, namely the budget of the *Ministère de la Recherche et de la Technologie* for the operating costs of the agency, and the *'budget annexe'* of the PTT (now PTE) Ministry for capital investment programmes have been discussed elsewhere. The nature of the Budget Ministry is of course to cut costs and encourage efficiency in the spending ministries which benefit from the public funding of the state budget. The annual budget negociations between the Prime Minister's office at Matignon, the Budget Ministry and the spending ministries can take on the form of running battles between ministers anxious to maintain or increase levels of funding for their particular sectors (in 1990, Jean-Pierre Chevènement - then at Defence - was an especially vivid example of the lengths some ministers will go to in resisting financial restrictions) and the political and technical constraints imposed by the Prime Minister in conjunction with the *Direction du Budget* at Bercy.

6.4.1. Prioritised sectors.

In general, the Budgetary policy *'traduit les objectifs du Gouvernement en matière de prélèvements obligatoires d'Etat et d'affectation de ses ressources'*.[32] In 1990 for example, French budgetary policy was influenced by three imperatives: the progressive reduction of the budget deficit; the lightening of the tax burden; and the control of public spending. Within these two general aspects of policy there can be priorities for spending; thus in 1990 Education, Employment, *Research*, Culture, Development aid and Housing were all 'favoured' activities.

The existence of prioritised sectors within the budget betrays the political latitude exploited by the government to favour certain measures, notwithstanding external pressures from the international economic system forcing France to toe the line in terms of budgetary, fiscal and public spending hygiene. In the process which determines the budget in France, such 'technical' economic factors are presented by the *Direction du Budget* in its recommendations for state spending and taxation. The political leeway enjoyed by ministries and by the government is illustrated by the possibility for ministers to contest the proposed spending levels, and by the fact that in the final analysis, disagreement between the Budget Ministry and a spending ministry (such as the MPTE for example) is always adjudicated by the Prime Minister with a political decision concerning the merits of the spending ministry's case. The diagram below illustrates the position of the Budget Ministry vis-à-vis spending on publicly funded research in general and CNES in particular :

The Budget Ministry and CNES



Popular opinion in France, supported by the uninterrupted increases in CNES budgets over the lifetime of the space agency, (see graphs of state spending on CNES in Chapter 5), holds the view that Space has been a prioritised case within the favoured sector of Research and High Technology.[33] The large proportion of the *budget civil de recherche et de développement* (BCRD) that is devoted to the

space agency and the way in which funding increases for space have been accepted even in times when funding for research in general has under pressure do indeed reflect the 'generosity' of the state towards space. The notion that space has traditionally been a favoured activity is not contradicted by CNES's financial masters, but it was somewhat qualified in 1989 and 1990 by the growing attitude at the Budget Ministry that CNES was 'financially irresponsible', as the following sections will make clear.[34]

The budgetary *tutelle* of the space sector is effected within the *Direction du Budget* by essentially two services, one of which, the *Bureau Recherche, Espace et PTT* deals with the civil aspects of CNES activities and the other, the *Bureau Défense*, oversees the funding of the Armed Forces, including the financing of the military space programmes. These structures of budgetary control reflect as usual the links space entertains with Research, Defence and Telecommunications. The *Direction du Budget* is frustrated in its desire to increase what it sees as the possible financial efficiency of the space sector in general and of CNES in particular by 'political' factors, as well as by what it sees as anomalies in the funding mechanisms inherited from previous structures and some 'automatic' trends in funding which should be reevaluated.

The 'political' factors which inhibit the Budget Ministry's quest for technical budgetary efficiency in a field even as far divorced, (at least in the past), from conventional cost-benefit analysis as Space, stem essentially from the special place occupied by the space sector in the thinking of the French state. In the 1980s this has been expressed in the view held at the Elysée that Space has a *'message unificateur'*, a view in turn expressed by Matignon in adjudication favourable to ministries involved in space activities during the annual process of *'arbitrage budgétaire'*, or budgetary negociations. The anomalies and rigidities of the way in which funding for CNES and the space sector is effected also make cost-cutting and revision of practices difficult. The 'ratchet effect'[35] created by CNES permanency compared with changing ministries and governments has already been mentioned elsewhere, but within ministries themselves there are traditions of funding which automatically maintain CNES at 'traditional' levels of financial importance within overall state spending. For example, the successive Ministries of Research/Technology have a habit of allocating a more or less fixed 25% of their budget *and any budget increases* to space, almost regardless of new factors which might cause a reevaluation of such a proportion.[36] CNES itself, in its transmission of state funding to industry and research institutes has created a situation in which the space sector is accustomed to 'support' from government, support described at the *Direction du Budget* as having become a private income

almost like 'a Ricardian rent '. Abstracting from the imperatives of prestige, national independence and military security which inform the Presidential and Prime Ministerial support for CNES funding and the maintenance of the space sector at traditional levels, the financial experts at Bercy see the situation as being one in which CNES is less and less in touch with macroeconomic realities.

6.4.2. Budgetary reality

Perhaps the most important of the structural factors having encouraged this divorce between CNES and budgetary reality is the mechanism of the *'budget annexe'*. As explained before, the greater part of CNES funding is channelled through the *'budget annexe'* formerly of the PTT Ministry and now of the MPTE. Along with the *'comptes spéciaux du Trésor'*, the *'budgets annexes'* represent an exception to the general budgetary rule of *'non-affectation des recettes aux dépenses'*, an exception justified by any combination of three reasons : the activities of the organisations financed are commercial in nature; for political or administrative reasons government wishes to give an appearance of autonomy to a public service; Parliament and the government feel that the 'useful' nature of the activities financed should be highlighted to increase taxpayers readiness to accept new taxes. The contents of the *'budgets annexes'* are in effect 'debudgetised', being considered outside the overall budget of the state. Although these budgets are supposed to be balanced, the simple fact that they escape to a certain extent the normal constraints on overall public spending represents, for the Budget Ministry, an influence increasing the 'financial irresponsibility' of the space sector. The fact that the MPTE *budget annexe* was by far the largest of the six budgets so organised[37] meant that the forthcoming reform of the Posts and of *France Télécom* was seen by the Budget Ministry as a welcome rectification of a 'detrimental' feature of CNES funding.

The *Direction du Budget* was at pains to point out that its cost-cutting fervour had a double objective in that it not only aimed at stemming the overall inflation of public spending but also, by moderating unwarranted or wasteful spending in some fields, at increasing the room for manoeuvre in funding other sectors.[38] In this perspective the momentum (or inertia) of CNES spending is both resented and criticised by the Budget Ministry. A specific example of this attitude was the *Direction du Budget's* disappointment at the 'automatic' increases in CNES funding for 1991, which they perceived as waste, given that no new funding needs were immediately apparent in CNES programmes. In terms of the tactics adopted by CNES, the Budget Ministry criticises the increases in funding which in its view will

serve CNES ill in the long-run because they are perceived as too large and insufficiently justified by the agency's long-term plan which actually projected an relative decrease in funding in 1992-93 considered unlikely to occurr by the *Direction du Budget*.

The *Direction du Budget* works in concert with the *Délégation générale pour l'espace* (DGE) in assessing the funding needs of the space sector, collaborating essentially with the *Service de mise en oeuvre de la politique spatiale* headed by Jacques Serris. While welcoming the creation of another body intended to survey the development of the space sector, the Budget Ministry remains somewhat sceptical as to the real powers of the DGE given that its double rôle of supporting and inspecting space sector activities puts it in a position where it can do relatively little to actually impose reductions in spending and programmes. Nevertheless, the 'rebudgetisation' of spending on space consequent on the reform of the Posts and Telecommunications elements of the MPTE is looked forward to as a step in the right direction, although it is feared that it may have repercussions both on the responsibilities of various ministries and also even on the concept of a 'global' approach to public sector civil research funding (the BCRD).

The overall attitude of the Budget Ministry is that the space sector seems to be largely independent of conventional financial safeguards. The justification that space is a politically favoured sector is accepted, although with the proviso that politically and financially prioritised sectors reduce the possibilities for action in other fields, at least in difficult economic conditions. The apparent relative autonomy of CNES in terms of funding and the anomalies of the financial mechanisms which finance the space sector are less acceptable to the experts of the Budget Ministry.

The frictions between CNES and the Finance and Budget Ministry exemplify the conflicts between agency autonomy and financial/political control of the Centre. The influence that CNES can bring to bear in resisting budgetary control and the pressures that it can exert in protecting its interests through the presidential and prime-ministerial support for space make the task of the *Direction du Budget* particularly difficult. French public policy in economics and finance comes into conflict with other objectives of other fields of public policy, of which space, a particularly onerous special case, has pretensions to being outside conventional cost-benefit analyses through its claimed effects of industrial catalysis and international 'grandeur'. Increasingly, however, in the late 1980s, it seemed that the state was attempting to graft new considerations of financial rigour into the space system through increased Budget Ministry vigilance.

To conclude this analysis of the relationships between CNES and various elements of government we shall now examine briefly the interaction between CNES and the Foreign Affairs Ministry.

6.5. CNES and the Foreign Affairs Ministry

Since the 1960s, the *Ministère des Affaires étrangères* has in its various guises boasted a department specialised in the issues associated with space activities. In the 1960s, the presence of such a competence within such a 'traditional' Ministry was found by many to be somewhat surprising, but the existence of the *Service des affaires spatiales* within the Ministry was justifed by a number of arguments all essentially based on the fundamentally 'international' nature of space activities. In a short article on the *Service des affaires spatiales* published in 1966[39] these reasons were enumerated in terms of the international nature of 'outer space' and in terms of the international cooperation required to launch and monitor rockets and their associated satellites. The *Service des affaires spatiales* was attached to the *Service des pactes* within the *Direction politique* of the Quai d'Orsay (the Foreign Ministry) and had two main tasks, firstly to liaise closely with CNES on matters concerning possible or actual international cooperation, and secondly to give its opinion on the possible economic or cultural effects of telecommunications satellite programmes.

This secondary (although important) advisory rôle has continued into the present period. The almost axiomatically international nature of many aspects of space activities has not changed drastically since the early years of the space effort, indeed, there are ever increasing trends towards cooperation because of the financial contraints of space programmes on national budgets (early cooperation was as much a result of technological necessity as of monetary problems). The rapid and massive development of telecommunications and broadcasting satellites has also created an increased need for Foreign Ministry expertise in matters pertaining to Space, since whether these programmes are solely national or, a fortiori, cooperative in terms of their production, their operation tends to involve many different countries. During the 1980s the Foreign Affairs Ministry has followed the development of space activities through its Economic and Political Affairs departments, what is now known as the *Sous-direction des affaires spatiales* forming part of the *Direction des affaires politiques*. The scientific, technological and cultural aspects of space matters are followed by the *Direction Générale des relations, scientifiques et techniques*, which is particularly interested

in and involved with the advanced communications technology satellite Olympus.[40] This particular ESA project seems of special interest to the Foreign Ministry because its rôle is to encourage new applications in telecommunications, broadcasting and education, and the French are particularly anxious to encourage national exploitation of such facilities as part of the *'rayonnement culturel'* of French culture and science.[41]

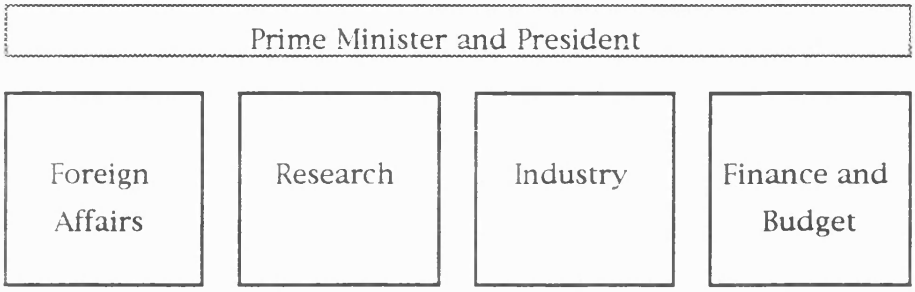
The traditional rôle of the Foreign Ministry in representing France at international meetings dealing with space related issues which was already under pressure from CNES itself has also since 1989 come under increasing rivalry from the MPTE and especially the DGE, both of which claim to have authority to represent French interests in space in international discussions.

The Foreign Affairs Ministry is the one which is most closely involved with the most basic elements of Grandeur furnished by the space effort to France, namely participation in international discussions and the management of international cooperation in bodies such as ESA. If French space activities were to become actively involved in the orbital politics of space station operation for instance, the Quai d'Orsay might begin to take on an expanded rôle in space affairs, but for the present at least, its activity is restricted to the international relations aspects of space. The increasing belief that satellite broadcasting furnishes a potent means of transmitting culture (for example the TV5 francophone channel on Eutelsat from 1984, and the Olympus programme led by the Foreign Ministry from 1990) may give an expanded importance to this classical aspect of 'grandeur' as well.

6.6. Conclusion

This chapter has shown the variety and complexity of ministerial links with CNES. Some of the ministries which work with CNES are what might be called 'user-partner' ministries since they interact with the agency on the basis of an interest in the space-derived services CNES can provide. Examples of these are the Industry (and PTT) and Research (and Technology) ministries. Other ministries work with CNES on the basis of an interest in monitoring the agency's activities, either in terms of the diplomatic aspects of high technology in the case of the Foreign Affairs Ministry, or, for the Budget Ministry, in terms of the conformity of CNES expenditure with the overall context of public finances. As has been described, the *tutelle* for the space agency has tended to move from Ministry to Ministry during the 1980s as a result of changing governments and ministerial

structures, changing 'ideologies' of industry, science and technology, 'ad hominem' attributions of ministerial portfolios and, most latterly, new ambitions to rationalise public policies and 'reform the state'. The diagram below illustrates in isolation from one another the main sources of interaction (and *tutelle*) between CNES and government during the period 1979-1988 :



As has become apparent in this chapter however, *tutelle* has rarely been exercised by single ministries, and the overall pattern of control over the space agency and the space sector has been complicated and confused. What might be best termed 'political *tutelle*' has variously been provided by the Industry and Research Ministries in their various incarnations and in various combinations, culminating in 1988 with the Ministry of Research and Technology, which nevertheless shared its responsibility for CNES with the innovatively constituted Ministry of Posts, Telecommunications and Space. Because of the varied scientific and developmental activities of CNES, the 'political' *tutelle* exercised by Research and Industry has also included some elements of technical expertise (although the space agency has always been the dominant partner). In the absence of a body equipped with a real base of scientific and industrial expertise responsible for the assessment of CNES activities on a properly technical level, a kind of 'technical *tutelle*' was exercised indirectly during the 1980s by the Budget Ministry and by the Ministry of Foreign Affairs in their attention to funding and CNES negotiations in collaborative space ventures. The Prime Minister and President have also interacted with the agency, but their rôle has been essentially one of arbitration, based on the Presidency's interest in space's contribution to France's 'image' in the international system and to the credibility of the nuclear deterrent and on the Prime Minister's responsibility as final pay master (or funding 'principal') of CNES.

In the following chapter we examine the MPTE and DGE, assessing what their creation implied about the state's attitude towards the patterns of *tutelle* applying to CNES and considering how their functioning may reflect a desire on the part of government to assert greater control over the space sector.

Notes to Chapter 6.

1 De Forges, Jean-Michel, Les institutions administratives françaises, PUF, 1985, pp.71-72.

2 Interview, Martin Boyle, (Scientific Attaché, British Embassy), Paris, 9 February 1989.

3 The success of CNES subsidiaries, exemplified by that of *Arianespace* indicates the partial evolution of the space sector towards 'commercial' applications and the provision of space-related services to private customers, and could create a trend towards greater financial autonomy for CNES. In such a context CNES would be less dependent on state funding endangered by macroeconomic uncertainties but might paradoxically find itself in a position of being threatened at first remove by the vagaries of commercial and industrial competition.

4 What might be termed the old-school-tie network of *Grandes écoles* alumni operates across the whole of French society, with graduates of each school, whether it be ENA, Sciences Po., HEC, Polytechnique or other less well known technical institutions being prepared to help others of the same group. Since students trained in specific institutions often tend to gravitate towards corresponding employment these networks intensify and then self-propagate as individuals move on in employment but retain contacts already established. There is thus a CNES mafia at CNES and a CNES mafia outside CNES.

5 During the late 1980s, the SERICS budget for joint venture industrial projects with space sector firms was a relatively modest 80-100 million francs. (Interviews, May 1990 and July 1990).

6 The Conseil lost its power to question the Ministerial representatives and *secrétaires d'Etat* of 'user Ministries' formerly represented in the *Conseil des applications spatiales*, which was itself abolished by the new decree.The first article of decree 79-468 provides for the *Conseil d'administration* to be composed of thirteen members in addition to the President, their Ministerial origins reflecting as usual the various governmental interests in space. Décret 79-468 du 13 juin 1979, Journal Officiel 16 June 1979, p.1427.

7 This was the major element of modifications already initiated in February by an *arrêté* redefining some aspects of the financial organization of CNES. Décret 84-510 du 28 juin 1984, Journal Officiel 29 June 1984, pp.2027-2029.

8 Loi d'orientation et de programmation du 15 juillet 1982 sur la recherche et le développement technologique de la France, Journal Officiel 16 July 1982, pp.2270-2280. In the spirit of moves to 'democratize' the public sector, the CNES *Conseil d'administration* was enlarged to include eighteen members made up of six members elected by the work force, as well as the five experts on the Centre's activities and seven state representatives of the Prime Minister, of the Economy Ministry, the Budget Ministry, the Defence Ministry, the External Relations Ministry, the Research Ministry and the PTT Ministry.

9 This proviso is importance in that it shows the limits to CNES autonomy, and how the financial control of the agency has been constantly an objective of governments afraid of losing control over the direction of CNES activities.

10 (Titre II, article 10.)

11 (Art. 9.) This marked tacit institutional acceptance that the responsibility for applications was moving outside the immediate ambit of the space centre's administrative and planning structures, thus prefiguring the situation of the 1990s, where industry is more and more responsible for all aspects of applications projects.

12 Décret 86-715 du 17 avril 1986, Journal Officiel 18 April 1986, pp.85548-85549. Décret 86-721 du 24 avril 1986, Journal Officiel 25 April 1986, pp.5757-5758.

13 It is thought that Devaquet let slip the predominance of influence over CNES acquired by the Research and Technology Ministry under the dynamism of Hubert Curien, the Industry Ministry profiting from the tactical error (and perhaps also CNES...).

14 This at least was the theory of the Chirac administrations attitude towards the economy in general, in imitation of the examples of deregulation and economic liberalism in Reagan's US and in Thatcherite Britain.

15 The British Embassy scientific attaché suggested that part of the reason for the change was Devaquet's weakness in arguing the case for maintaining the status quo of tutelle. (Interview). The beginning of the Cohabitation period coincided with the first months after the Challenger shuttle accident, period in which the Ariane launcher and French technology had a high world profile. On the domestic level, the new Ministers soon realized the media potential of Ariane launches and the advantages of being present at Kourou to profit from television coverage of such events.

16 Defining the attributions respectively of the Ministries of National Education and Industry, PTT and Tourism. 86-715 of 17 April 1986 added to the decree of the Fabius government 86-129 which had defined the organization of the Central administration of the PTT Ministry. The rôle of Devaquet as *Ministre délégué* was set out in decree 86-721 of 24 April 1986.

17 This particular replacement was due to Devaquet's failure to cope with the explosive protests in Universities over his attempted Higher education reforms, but offers another example of how extraneous political events can affect continuity of policy in a given field.

18 We have shown in the preceding chapter how funding for CNES has often been channelled through the PTT, particularly, during the mid-1980s, through the PTT 'budget annexe'.

19 In the Conclusion, we shall address the question of "industrialists' policy" as an explanation of the true origins of space industry policy.

20 *le ministère doit être le moins possible un organe de gestion,...mais un centre de réflexion, d'écoute, de concertation et de répartition... il doit disposer d'une réelle compétence scientifique et technique, ne serait-ce que pour justifier l'agrément des autres ministères vis-à-vis desquels nous sommes amenés à prononcer des arbitrages. D'autre part, nous devons aussi assurer avec efficacité la tutelle des organismes de recherche.* Interview in La Recherche, October 1988.

21 Journal Officiel, 24 January 1989, p.2526.

22 *Terre, Océan, Espace et Environnement.* This department replaced the previous service responsible for mediation between the Research Ministry and CNES, namely the *Direction de l'organisation et de la promotion de la recherche* (DOPR).

23 'instruit les propositions relatives au budget des organismes de recherche'., Point Carré, (MRT Newsletter), May 1989.

24 The modernization of the *Direction générale de la recherche et de la technologie* aimed at two main objectives within the functioning of the Ministry itself : firstly facilitating the management of the various scientific and technical departments and creating synergies between their specific field of expertise; secondly, (an objective concerning the impact of the Ministry on French science and technology in general as much as the working methods of the MRT), the laying of new emphasis on the science and technology dossiers neglected under previous Ministers.

25 *Le ministère des PTE est un ministère "opérationnel". L'équipe dirigeante décide d'une politique, mais est aussi chargée de la mettre en oeuvre, et en subit les conséquences: la boucle de responsabilité est complète et assez courte. Ici (au MRT) c'est plus difficile: nous élaborons les orientations pour des organismes dont nous avons la tutelle directe ou conjointe, ou nous encourageons des actions industrielles. Les effets de cette politique ne seront pas directement perçues au sein de notre organisation. Notre responsabilité s'en trouve accrue, car les choix que nous ferons auront des conséquences à long terme et seront vécus pratiquement au niveau de la collectivité nationale'* (The quote ends with a revealing expression of the fundamental societal importance of MRT undertakings)Didier Lombard (DGRT), interview in Point Carré, May 1989. Heavy emphasis added.

26 Interview, MRT/TOEE, 13 December 1989.

27 The expression "courroie de transmission intelligente' is often used in contexts such as trades unions where it describes the communication of orders from (say) the Communist party to the CGT (Communist union).

28 Interview, MRT, 26 May 1989. The case of Daniel Sacotte is an interesting example of the facility with which exchanges of personnel can take place between various organisations in the high-tech sector; Sacotte was initially *Directeur des Affaires internationales* at CNES before moving with Curien to the MRT. He returned to CNES in 1990.

29 View expressed by Vidal-Madjar, TOEE, interview, 13 December 1989.

30 Interview with Jean Gruau, *Inspecteur Général au CNES*, CNES, 22 November 1989.

31 This somewhat trite statement is not as fatuous as might at first appear since CNES does also have a certain latitude in funding because of its "own resources".

32 Budget 1990, numéro spécial Les Notes bleues, No. 488, 14-20 May 1990, p.9.

33 Research was described by President Mitterrand early in his first septennat as *'l'enfant chéri de la République'*. For a rapid overview of research funding since 1981, see Jean-François Augereau, L'enfant chéri de la République, Le Monde, 24 March 1993, p.21.

34 Interview, *Direction du Budget*, July 1990.

35 The French expression is *'effet de cliquet'*.

36 Interview, Marc El Nouchi, *Bureau Recherche, Espace et PTT, Direction du Budget*, 2 July 1990.

37 *Prestation sociales agricoles, Légion d'honneur, Ordre de la Libération, Navigation aérienne and Monnaies et Médailles.*

38 Same source.

39 Thierry Godechot, 'Le Service des affaires spatiales du Ministère des Affaires Etrangères Revue générale de l'Aviation et de l'Espace (1966.1), pp.90-91.

40 Interview, Régine Thomas, *Coordination générale Olympus, Ministère des Affaires Etrangères*, June 14 1990.

41 C. Bulloch, 'Olympus: Pilot plant for future telecoms', Space Markets (4/1989), pp.226-232.

7. CNES, the MPTE, the DGE and the MELTE 1988-92 : interaction redefined

The most obvious feature of the relationship between CNES and government during the greater part of the 1980s was the complexity of links between the agency and the many and varied ministries with whom it dealt. In 1988 however, reforms were implemented which initiated changes in the interface between the space sector and the state. As we have seen in the previous chapter, the return of a Socialist government in 1988 led to a restructuring of *tutelle* for CNES through initially the Ministry for *Education nationale, Recherche et Sports* (from 28 May 1988) and then Hubert Curien's Ministry of Research and Technology (MRT), from 20 July 1988. Most significantly however, the new government also created a 'Space Minister' in the form of Paul Quilès, Minister of Posts, Telecommunications and Space.[1] The primary task of the new *Ministère des Postes, des Télécommunications, et de l'Espace* (MPTE) was to 'assure the coherence of overall government space policy'.[2] In order to help in this mission, the Ministry created a *Délégation Générale à l'Espace* (DGE) and a *Comité de l'Espace.*

Such a redistribution of tutellary responsibility for CNES in 1988/89 by the Rocard government was perhaps the first example of a will on the part of government to implement appropriate institutional changes to the structures of tutelle of CNEs and the space sector, rather than to simply 'reshuffle' tutellary authority from ministry to ministry on the basis of either convenience or vague 'ideological' convictions about the status of space as an 'industrial' or research issue. We have already looked at the contribution of the MRT created by the Rocard government in the preceeding chapter, and will here concentrate on the MPTE and the DGE during the period May 1988 to May 1991, when the replacement of Rocard by Edith Cresson led to a further restructuring of *tutelle* for CNES. We shall also consider what the structure of *tutelle* under the Cresson government in 1991-92 implied about the experience of 1988 - 91. The plan of the chapter is thus the following :

- **7.1.** The MPTE and *Comité de l'Espace* : Rocardian rationality ?
- **7.2.** The *Délégation Générale à l'Espace*
- **7.3.** Assessment of the MPTE and the DGE
- **7.4.** The MELTE : Cressonian confusion ?
- **7.5.** Conclusion

This chapter will conclude our treatment of the civil inputs to policy making. The third section of the thesis which starts with Chapter 8 will look at military space.

7.1. The MPTE and the *Comité de l'Espace* : Rocardian rationality ?

Until 1988, the ministerial responsibility for the space sector was shared essentially by the ministries entrusted with the industry and research and technology briefs. The return to power of the Socialist government after the period of *Cohabitation* was marked by a double administrative novelty as far as space was concerned. This novelty was firstly that in a reorganisation of ministerial responsibility the *tutelle* of space was transferred from Industry, Posts, Telecommunications and Tourism to a new ministry amalgamating the Posts, Telecommunications and Space, or the MPTE (thereby excluding industry), and secondly, that new bodies intended to help manage the space effort were also created.[3]

In the first instance, the new *Ministère des Postes, des Télécommunications et de l'Espace* headed by Paul Quilès exercised its authority over CNES jointly with Lionel Jospin's Ministry of National Education, Research and Sports until these latter briefs were separated into an Education Ministry under Jospin[4] and the *Ministère de la Recherche et de la Technologie* headed by Hubert Curien. This was the first time since the 1960s (when space and atomic affairs were represented by a *Secrétariat d'Etat)* that 'Space' was explicitly present in the title of a Ministry. The shift of authority for space away from the industry brief in government towards its own ministry (shared with the closely linked field of telecommunications) and Research was consecrated in the statutes by the modification of decree 84-510 defining the organisation and functioning of CNES. Decree 89-77 of 6 February 1989 codified the reversal of rôles, specifically stating that the representative of the PTT Ministry in the CNES *Conseil d'administration* (no longer necessary because of MPTE *tutelle*) was to be replaced by a representative from the Industry Ministry.[5]

The 'rearrangement' of existing responsibilities into the MPTE in Summer 1988 was complemented in December 1988 and during the course of 1989 by the second novelty of the new government's approach to the space sector, namely the *ex nihilo* creation of two bodies within the Ministry which were intended to strengthen the new Minister's control over space affairs and to ensure efficient governmental control of the sector. These two bodies were the *Délégation Générale à l'Espace* (DGE), and the *Comité de l'Espace.*[6]

In terms of the general trend of space policy from the 1960s through the 1970s and 1980s, the creation of two such institutions, as well as the presentation of Space as an explicit Ministerial responsibility were the expression of essentially two factors. These two factors were firstly the permanence or continuity of political backing for space and, secondly, the desire for effective control of space matters by the political authorities. Expressed in ministerial-administrative vocabulary these two factors translate as *'cohérence'* and *'tutelle'*.

7.1.1. '*Cohérence*' and '*tutelle*'.

With state enthusiasm for space activities taken as a usually stable datum line for the making of all space policy, *'la cohérence de l'ensemble de la politique spatiale'* (as the concept is expressed), is of crucial importance for the efficient exercise of *tutelle* itself, even if the *tutelle* is split, essentially between the MPTE/DGE and the MRT but also with inputs from other ministries such as the Quai d'Orsay.[7] The wide variety of projects, programmes and activities coming under the global heading of space creates a permanent need for *interministerial coordination* and also the need for the tutellary body to possess sufficient *technical expertise and hierarchical importance* in the space sector itself to be able to give authoritative judgment on the strategy to be followed in space policy.

The administrative innovations of 1988 and 1989 represented both continuity and change when viewed within the context of space policy trends. They signified simultaneously the permanence of political commitment, but also the new (at least in institutional terms) desire to ensure effective state control of what seemed to be a developing and burgeoning sector.[8] In such a perspective, the creation, organisation and missions of the MPTE and the DGE reveal the tensions inherent in the system of space affairs in the 1980s and the State's attempt to manage these tensions to the best advantage. The justifications for the creation of the MPTE/DGE and the timing of the decision to innovate in the field of space *tutelle* go some way to revealing the pressures and motivations involved. The why's, when's, wherefore's, who's and how's show the complexity of the influences involved in the overall determination of the making of space policy.

The person and personality of Minister Paul Quilès are not for nothing in the creation of the new ministerial portfolio. There is a strong presumption that as a senior member of the Socialist Party and as a former Defence Minister[9] his appointment to the head of a new large ministry may have been determined to a considerable extent by political motivations, namely the desire to give a more than ordinarily important ministry to an influential party worthy. A less cynical and more

prosaic explanation for the creation of the MPTE itself would be that there is a natural and common-sense link between telecommunications and authority for space to the extent that satellite telecommunications are perhaps the major operational commercial feature of space activities. In this view, combining the two portfolios within a single ministry, (with that for space no longer hidden within broader considerations of overall industrial policy) must appear at first sight as an exercise in the *rationalisation of ministerial structures*. A further contributing factor in the creation of the MPTE/DGE was also quite simply the increasing budgetary importance of the civil space programme with its rising commitment to European projects such as Ariane V, *Hermès* and *Colombus*, added to which was the burden of a renewed military space programme launched in 1986/87 and whose coordination with the civil effort was seen to be increasingly crucial.

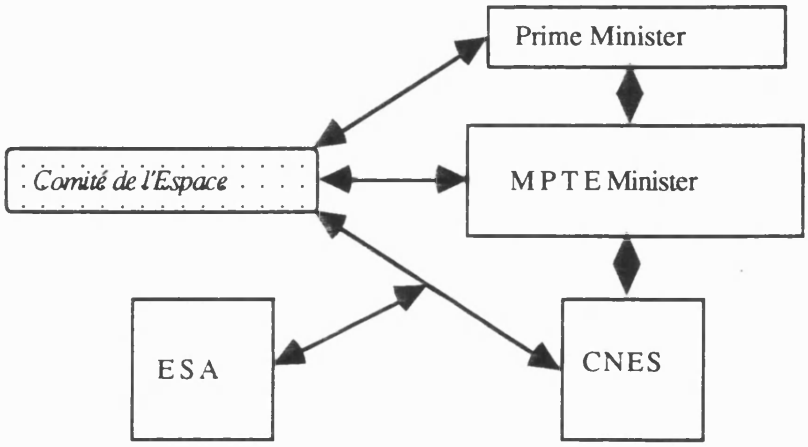
Although the *Délégation Générale à l'Espace* is an integral part of the PTE Ministry, a large part of its work being to inform the decisions of the Minister on space policy, the logic of the creation of the Ministry itself and of the *Délégation Générale* respectively were not identical. In terms of the dual imperatives of government in the space sector, the MPTE mainly fulfilled the rôle of coherence while the DGE contributes to the control of space sector activities.[10] Although, as implied above, these two imperatives are closely if not inextricably linked, the difference in the founding logic of the DGE and the MPTE enables a distinction between the importance of the institutional innovations to be drawn. This theoretical ('ideological') deduction is that given a primary desire for coherence in government approaches to space, the setting up of the MPTE and its attribution to Quilès were essentially typical of the general trend in space policy organisation, although discussion below of the reasons behind the twinning of Space, Posts and Telecoms will nuance this initial and generally valid hypothesis. The creation of the DGE and of the *Comité de l'Espace* would however seem to reflect a break in the traditional pattern of state control of space, in the sense that a desire to increase the means of *tutelle* at the disposal of the government implied either a change in attitude, or a change in circumstances, or both. The MPTE was an institutional response to the gradual evolution towards maturity of the space sector. The DGE is an institutional response to a perceived new need on behalf of government for increased authority over certain developments in the general evolution of the sector.

We shall address in detail the nature, activities and significance of the DGE in a later sub-section of the chapter; here however we will examine the *Comité de l'Espace*.

7.1.2. The *Comité de l'Espace*

Since July 1989, the influence of the CNES Board of Administration (*'Conseil d'administration'*) in the definition of policy has been somewhat reduced by the existence of the *Comité de l'Espace* attached to the minister responsible for space matters.[11] July 1989 saw the institution of the *Comité de l'Espace* in the MPTE.[12] A *Comité des recherches spatiales* had existed between January 1959 and February 1962 before being transformed into the *Conseil de l'Espace.* The *Comité de l'Espace* of 1989 was created as an extremely high level pluridisciplinary body advising the Prime Minister. Working under the chairmanship of the minister responsible for space matters (at that time Quilès), the new *Comité de l'Espace* included extremely high-ranking officials from government, the Armed Forces and CNES covering all aspects of space sector activities, whether civil or military. Members currently include the *Délégué Général pour l'Armement,* the Director Generals of Industry, Telecommunications and Research and Technology, the *Chef d'Etat-major des Armées*, the President and Director General of CNES and the *Délégué Général à l'Espace.* The wide range of organisations and *corps* represented within the *Comité* was intended to enable its proceedings to enhance the *coherence* of overall space policy and thus facilitate the MPTE's work in the space sector. Specifically, as of July 1989, the Committee had four briefs : preparing the decisions taken by the government in the field of space policy; studying the industrial impact in France and in Europe of the space programmes; elaborating in conjunction with CNES French options in international collaboration in space matters; and finally, exercising an advisory rôle to the Prime Minister.[13]

Comité de l'Espace interactions with CNES and government



Thirty years on, in comparison with the *Comité des recherches spatiales*, whose briefs were essentially to survey resources, anticipate problems of interministerial and international cooperation and to propose research projects to the Prime Minister, the *Comité de l'Espace* of 1989 has a more direct influence in space policy. The accent placed on space research in the 1960s has been replaced with concern about the industrial impact of space programmes on the French and European economies and the overseeing rôle of the previous institution has given way to a more active and prescriptive task of helping prepare government decisions in space policy and proposing to the Prime Minister any measures felt necessary for the overall coherence of the space effort.

The more direct influence of the 1989 *Comité de l'Espace* compared with the *Comité des recherches spatiales* may seem paradoxical in terms of the maturity of the sector, but the apparent paradox of a mature sector requiring more state guidance than an infant industry becomes clear when considered in the light of government-agency issues of coherence, power and control.

Meetings of the *Comité de l'espace* 1989-1992	
10 December 1989	*Comité de l'espace* presided by M. Paul Quilès (MPTE) reviewing national military programmes, civil telecommunications and observation programmes, discussing future satellite requirements for 2000-2010.
12 June 1990	*Comité de l'espace* presided by M. Paul Quilès (MPTE) discussing France's European space programmes and a possible European disarmament verification satellite.
11 December 1990	*Comité de l'espace* presided by M. Paul Quilès (MPTE) discussing international space policy.
11 June 1991	*Comité de l'espace* presided by M. Paul Quilès (*ministre de l'Equipement, du Logement, des Transports et de l'Espace*) discussing the use of space during the Gulf War, France's European space programmes, and the French contributions to European meteorological satellite programmes.
23 January 1992	*Comité de l'espace* presided by M. Paul Quilès (*ministre de l'Equipement, du Logement, des Transports et de l'Espace*) discussing the Ariane V programme and mobile satellite telecommunications.

(Source : CNES Annual Reports and La Lettre du CNES)

Below, we look at the *Délégation Générale à l'Espace*.

7.2. The *Délégation Générale à l'Espace*

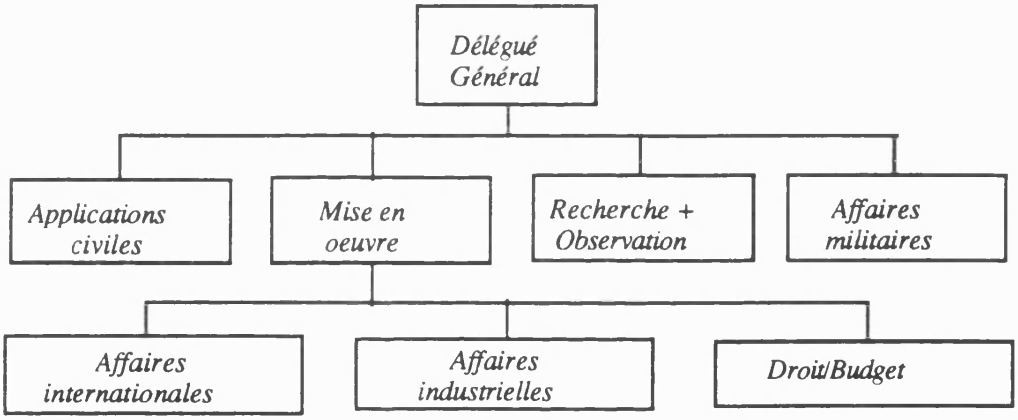
The issues raised by the creation of the MPTE/DGE and the concomitant questions of timing and personality (Why 1988 ?, Why Quilès ?) can be explained by an examination of the stated missions of the DGE. In order to fulfil the missions assigned to it, the DGE is naturally endowed with independent structures and personnel whose task is to interact with the other actors of the space sector. The following analysis of the DGE presents the practical organisation and activities of the new institution, which reveal the real motivations of the innovations of 1988/89. In arriving at an assessment of the motivations and success of the DGE a practical difficulty intervenes, namely, that compared with the long term span of of French space activities, the DGE is a new phenomenon.

Following the placing of real, direct authority for space matters solely with the new MPTE structure, the final innovation of 1988 saw the creation of the DGE within the central administration of the Ministry. In accordance with a report submitted by the MPTE to the Prime Minister, the decree 88-1121 of 14 December modified the organisation of the 'PTT' Ministry to include the DGE amongst the directorates and services *directly attached* to the ministerial cabinet, an indication of the hierarchical prestige of the subject matter it was dealing with.[14] An additional article was appended to the modified Decree 86-129 of 28 January 1986 to state the aims and functions of the DGE as being to facilitate the coherence of space policy through the preparation of studies, meetings and negotiations, and through assisting the Minister in *the exercise of tutelle* for CNES.[15]

The hierarchical importance of the DGE (reporting immediately to the minister) was thus a direct reflection of the importance of its responsibilities. The post of *Délégué Général* was filled in early January 1989 with the nomination of *Ingénieur général des Télécommunications* Michel Petit.[16] With experience of the CNET and of the CNRS, as well as having been the French Science and technology *attaché* at France's Permanent Representation to the European Community from 1985 to 1987, Petit left his function of *Commissaire du Gouvernement* at CNES,[17] and that of *Délégué aux affaires internationales* at the MRT. Petit's considerable experience of things spatial and of the telecoms industry showed how the importance of the post was viewed to require someone with experience and perhaps an international vision. In a more critical light, it can be pointed out that his appointment represented very much the choice of someone from within the space/MIC system itself.

Concretely, the institutional definition of the DGE and of its missions found organisational expression in a team of some fifteen administrators housed within the MPTE whose daily activities revolved around two main themes. These themes of course reflect the sometimes ambiguous relationship between coherence and control. In DGE terminology they are *'concertation'* (or the encouragement of liaison and collaboration), and the *'suivi'* (or overseeing) of short term implementation of space policy. The organisational chart of the DGE reveals this administrative and functional distinction between the twin branches of activity, but in practice of course the relationship is far from being one of hermetic separateness. The diagram below illustrates the structure of the DGE :

The organisation of the DGE



The *Délégué Général* is assisted by three *délégués adjoints* and by an advisor for strategic (in other words - military) affairs. Two of these high level aides contribute towards the overall *concertation* between space users in the fields of civil space exploitation and space science/earth observation. The rôle of liaising with military space activities is of course inherently a concertative one, but it is given a relatively less important place in the DGE compared with the other concertative tasks in order to avoid duplicating existing consultative structures involving the Defence Ministry, the DGA and various space user ministries. Moreover, the 'part-time' nature of the strategic affairs advisor's collaboration with the DGE (Mme Bonnevie's principal responsibilities are with the DEN/DGA) are characteristic of the relatively informal nature of the 'coherence' brief of the DGE, for example, MM. Michel Glass and Alain Giraud, the two vice general delegates work essentially alone or in collaboration with the *Délégué Général* himself in establishing contacts, polling opinions in the scientific and industrial communities, questioning the viability and interest of projects and encouraging synergies. The

relative informality of the DGE's methods of operation is not to be taken as an indication of lack of influence, and it must be remembered that the liaison between the MPTE and the Defence Ministry/DGA, although doubling existing, essentially military, coordinating structures was a true innovation in the sense that it increased the potential for communication between the organisations charged with the control of the civil and military sectors.

7.2.1. *'Concertation'*

The work of vice-DG Michel Glass, who is responsible for *'Recherche, affaires scientifiques et observation'* furnishes a useful example of the mechanisms of DGE surveillance of the overall coherence of space policy.[18] A scientist by training and professional experience, Glass's current brief is the administration of space research and of space-based observation projects. The appointment of a technical expert to an essentially administrative post illustrates the important point that the DGE provides an alternative source of technical expertise for the government and administration of the space sector.[19] Before the creation of the DGE, the Industry and Science Ministries of the classical model of *tutelle* were essentially reliant on technical appreciations originating from CNES itself. This previous monopoly enjoyed by CNES is reflected at present by frequent reference within the DGE to CNES 'hegemony' and to the existence of a CNES 'mafia'. The rôle of the DGE through Glass is to temper the ambitions of CNES expressed in the projects it submits to the MPTE for inclusion in the annual budget allocation. This tempering is effected through what amounts essentially to a cost-benefit analysis informally conducted but resulting in an assessment of the quality, usefulness and national interest of the project under consideration. Evaluated in such a way, a CNES proposal for a probe to explore the asteroid belt was rejected by the DGE on the grounds that it was too ambitious and lacking in real advantages for France, whereas the Franco-Soviet *Antarès* was encouraged as useful value-for-money international cooperation.[20]

The technical assessment made by Glass of proposals is then communicated to CNES which either modifies or withdraws the project. Projects gaining the immediate approval of the DGE are presented through the *Délégué Général* and the MPTE Minister to the Government. If despite the DGE's efforts to ensure the most harmonious level of projects proposed for budgetary support this level of hoped-for funding is still in excess of the limits desired by the Finance and Budget Ministry the evaluation which then intervenes becomes strictly political.[21] This is to say that while DGE selection is based on technico-budgetary criteria, the

ultimate decision on CNES funding for any given year is taken by the Prime Minister as an *arbitrage* between the Budget Ministry and the MPTE.

It must be remembered that the *Département Terre, Océan, Espace et Environnement* (TOEE) of the MRT also exercises a rôle in the administration of space science. The activities of the DGE and of the TOEE are complementary in the sense that the TOEE promotes initiatives whereas the DGE encourages synergies and attempts to deter ill-considered projects. According to Glass, (whose former colleague Vidal-Madjar in the CNRS now works in the TOEE), the fact that the DGE and MRT technical analysts come from a background of professional science rather than being career civil servants means that they enjoy an independence of judgement denied to other administrators.[22]

This pattern of relatively informal concertation and negociation is repeated in the final branch of the DGE's coherence brief, namely the follow up of civil space exploitation. *DG-adjoint* Alain Giraud has the responsibility *'de faire la synthèse de tous les usages civils des possibilités ouvertes par l'exploration spatiale'*.[23] Interministerial collaboration is once again the watchword in this dimension of the work of the DGE, whether the programmes of civil space exploitation are commercially orientated or whether they answer *'impératifs stratégiques d'indépendance nationale'*.[24] As well as organizing cooperation between ministries and national industry, this task requires negotiation on the European level (with the ESA and with international high-tech consortia), and internationally, given France's collaboration with the USA and the USSR.

7.2.2. *'Mise en oeuvre'*[25]

The second brief of the DGE is, as noted above, that of overseeing the implementation of space policy in the short term. This represents the more structured and formal element of DGE activity, being undertaken by *Délégué général adjoint* Jacques Serris assisted by three *'chargés de mission'* entrusted with responsibility for Budgetary and legal affairs, International affairs and Industrial affairs. These administrators thus interact with all the organisations and ministerial bodies concerned with the overall space program, ranging from the *Direction du Budget* through CNES and the ESA to the individual firms making up the space sector. For some, the ethos of the DGE is to be seen as fulfilling the rôle of easing the path of space policy, of being the oil in the machine which ensures its smooth running. This rôle is exemplified by the activity of the DGE's task of 'instructing' (or drawing up) the budget requests made by CNES and of preparing the legal packages necessary for the execution of programmes. In

terms of finance, this necessitates liaison with the Budget Ministry, and for the legal side of dossiers, with the MRT. Similarly, the DGE's rôle in facilitating international collaboration is restricted to working with CNES on proposals for international projects and negociations with the ESA.

The final element of the *'mise en oeuvre de la politique spatiale'* is one which like the functions of the advisor for strategic affairs which previously existed as an independent feature, has increased its importance through being included in the brief of the DGE. The fact that this responsibility was previously a function of the Industry Ministry also leads us naturally to a consideration of the usefulness of an independent tutellary body such as the DGE as opposed to dispersed functions of liaison and control characteristic of the period before 1988/89. It would in fact seem that the centralised independent tutellary body offers advantages of efficiency and rapidity of reaction over the previous system. This final element of short term policy is the promotion of industrial policy initiatives with the space sector, which is the responsibility of the *chargé de mission* for Industrial affairs.

The task of encouraging the space industry through what are described as *'actions ponctuelles de politique industrielle'* was originally confined solely to the Industry Ministry's *Service des Industries de communication et de services* (SERICS) forming part of the *Direction Générale de l'Industrie* (DGI), which devolved a budget of some 80 million Francs to the firms of the space sector. The DGE now has a similar budget (100 mF) intended to encourage the international competitivity of French space industry across the whole range of firms making up the sector from the big five[26] to the *'équipementiers'* (or components suppliers) working for the traditional *'maîtres d'oeuvre'* of the large programmes. Rather than giving grants or subsidies to the firms concerned, the DGE's principle for the measures is that the ventures must be cofinanced by the individual firm with the DGE but with the firm supplying a minimum of fifty percent of the costs, thus representing an attempt to move away from the French system of a Ricardian rent to high-tech industry.

This overview of the missions and organisation of the DGE has highlighted the principal points of interaction between the institution and the various actors of the space sector. Despite the relative informality in procedure of some of the DGE's activities it can be seen that certain tensions exist where the tutellary body interacts with the institutions it has to regulate. It is clear that the DGE itself was created out of similar tensions between CNES and the government itself. The resolution of conflict between government and the national space agency can be seen as the implicit *raison d'être* of the DGE, but its success as an institution in

its own right is dependent on its ability to maintain an efficient relationship with both government and CNES. In automotive terms, a brake which overheats is essentially an inefficient and even potentially dangerous safety feature. In contrast to the DGE, which faces external tensions with internal cohesion, the MPTE would seem to embody internal weaknesses deriving from the variety of ministerial responsibilities it encompasses. These two features of inter-institutional tension and intra-ministerial instability are crucial in explaining the evolution of space policy in 1988/89 and after.

7.3. Assessment of the MPTE and of the DGE

The assessment of the performance of the DGE during 1988-91 was complicated by a number of factors, amongst which the foremost was the newness of its rôle when viewed as part of the long-term history of the French space effort. Another problem was that of comparing DGE activities with past practices exercised by other bodies. Conversely, the question arose of how to evaluate the success of the new functions assumed by the DGE. The nexus around which assessment must turn is composed of the various interfaces (direct and indirect) between the DGE and CNES. As we have seen above, the DGE interacted through informal structures with CNES and other bodies in attempting to ensure coherence, but in managing the implementation of short-term policy this interaction was more direct. Discussion with the two branches of the DGE revealed a difference in the perception of the nature and success of these interactions.[27] However, the characteristic feature of the DGE's existence and activity was potential conflict with CNES, and it is obvious that the rationale of its creation was to 'manage' CNES in such fashion.

During 1988-91 the question of the life span of the DGE and of the level reached by its activities was also open to different interpretations from different quarters. A view expressed at CNES in February 1990, after the DGE had been operational for little more than a year was that the new body had already reached its *'vitesse de croisière'*, or cruising speed, and that it should expect to gain no greater control over matters in the future.[28] This opinion was not shared by *Délégué Général adjoint* Michel Glass three months later, who saw that an extension of DGE responsibilities was likely. Indeed, on a purely statutary level of analysis, the nature of the DGE as a institution tended to support the view that it could look forward to a long career as a regulatory body and a consequent gradual accretion of functions and tasks. In effect, the choice of setting up a *délégation*

générale rather than a *délégation interministérielle* reflected a long-term commitment on behalf of the government in 1988. Within the MPTE the decision to create the DGE was part of a long-term vision of increased control of the space sector by government. The unavoidable conflict between CNES and the DGE perhaps threatened the viability of the DGE, whose existence in its initial form was also dependent to some extent on the perennity or otherwise of the MPTE itself. As noted above, the reorganisation of space affairs into a ministry combining the Posts, Telecommunications and Space was apparently a common-sense grouping of portfolios which were complementary and best served by centralised treatment in a single ministry. On closer inspection however, this operational administrative rationale appears a less than perfect guarantee of a stable institutional background to DGE activities. The natural synergy between Posts, Telecommunications and Space was perhaps no more than a happy coincidence in the creation of the MPTE, since it can be argued that the conflation of the three briefs was undertaken more for reasons of budgetary harmony than because of a desire to create an integrated 'superministry'.[29]

7.3.1. The MPTE as a 'tactical' aspect of space sector management.

In this context, the on-going reforms of the Posts and Telecommunications aspects of the MPTE during 1988-1991 seemed to bear out the view that Space, Posts and Telecoms were grouped together in a reflection of past budgetary practices rather than as part of an integral strategic vision. In fact, the creation of the MPTE is best understood as a tactical (as opposed to strategic) feature of the French state's vision of the structure and uses of the space sector. The root of the problem to be resolved by the MPTE reforms lay in the practices of the 1970s when the government decided on a massive investment in the telephone and telecommunications infrastructures and in the channels through which funds for this programme were funnelled. In effect, the funding for the modernisation passed through the PTT Ministries and the *Direction Générale des Télécommunications* (DGT) as pure investment and as such was not considered as a taxable resource. In the 1980s however, when the infrastructures created by the 1970s investment became commercially viable and began producing revenues they became the source of potential income for the state as taxable revenue. Instead of taxing the revenues as they accrued to the PTT however, the decision was taken to tax the PTT budget directly, thereby avoiding a fictional financial exchange between the Budget Ministry and the PTT. Since funding for CNES essentially transited through the PTT Ministry's *'budget annexe'* during 1985, 1986,

1987 and 1988, this situation meant that CNES subsidies were being taxed for Telecom purposes.[30] The first step to rectifying this set of circumstances, a so-called expedient measure (or *'régime d'expédient')* was the merger of the interested parties in a single ministry (the MPTE), which was then called upon to separate them through the reform of the statutes of *La Poste* and of *France Télécom*, (formerly the DGT). Once these two state services were hived off from the central administration of the PTT in a form which would make them largely private enterprises run on commercial lines, then the state would be able to tax their profits in the normal fashion.

The reform of the statutes of *La Poste* and of *France Télécom* was intricate and was only expected to become operational in 1994. This meant that the DGE (as part of the MPTE) was thought to have at least a period of four years of relative institutional stability before it. In the years to 1994 it therefore seemed that the evolution of the DGE would be determined mainly by its relationship with CNES and with the ESA on the one hand, and with the MRT on the other hand. The feeling of those responsible for both facets of the DGE's activity coincided in suggesting a constant and probably increasing rôle for the *Délégation*. The reasons adduced for these views differed however according to whether they were based on the activities in favour of coherence in space policy or on the management of short-term policy.

The self-assessment of those involved in increasing coherence of policy was positive, despite the unavoidable problems posed by CNES's expertise and hegemonic tendencies; existing coherence between CNES and the CNRS for example was successfully emulated in other fields. The independence of the DGE's sources of information was generally reliable, except in the field of earth observation where CNES was in a position of monopoly because of its domination of the SPOT programmes. A point of friction between the DGE and CNES was however to be found in the position of CNES vis-à-vis the ESA, where the DGE also represented France, thus destroying the national space agency's monopoly of negotiations on the European level. In terms of budgetary or technical criteria this monopoly was less dangerous than at the national level because in order to be accepted by the other ESA members, CNES projects have to be efficient and internally coherent. In terms of prestige and influence however, CNES felt that this situation represented a retrograde step. Given that before the creation of the DGE *'le CNES faisait un peu ce qu'il voulait'*,[31] and that DGE surveillance of space activities was relatively successful during 1990 and 1991, the general view was that the *'vitesse de croisière'* had not yet been reached and that the rôle of the DGE would increase as CNES became more used to the existence of a more

technical *tutelle*. Indeed in the longer term it was thought possible that the "*double tutelle* "(MPTE/MRT) of CNES might be abolished because of the possibility it offered to clever dealings by CNES in playing off ministries against one another in order to create a vacuum of authority. In the event of a reform of the *tutelle* system it was naturally hoped in the MPTE that the DGE would undertake the responsibility thus created.

7.3.2. The future of the DGE

For Jacques Serris, responsible for directing the implementation of short-term policy, any assessment of the performance of the DGE had to be coloured by the thanklessnesss of the task of *tutelle*, *tutelle* being a *'tâche ingrate'*, or thankless task.[32] The tension created by the thanklessness of the task reflected a more conflictual understanding of the relationship of between CNES and the DGE than is evident in the more informal functions of the DGE's coherence brief. Serris's view was that the DGE was not really a force in the system of space policy, but was more accurately the oil in the machine which allowed its smoother functioning. The DGE was thus aiming at increasing the 'intelligence' of the overall space programme without reducing its efficacity. The tension between CNES and the DGE was expressed in the form of criticisms that the staff of the DGE are *'des empêcheurs de tourner en rond'* (troublemakers) and the assertion, oft-repeated, that the DGE *'ne sert à rien'* (had no useful purpose). This reluctance to accept the intervention of the tutellary body was proof *a contrario* of the need for increased control and a reflection of the fact that the DGE was in fact serving some purpose, however much one could criticise its marginal impact in certain quarters.

In terms of the permanence of the DGE, this view implied that the need for it would continue, and that its rôle and influence were likely to increase as CNES resistance weakened. This resistance was expected to weaken because the DGE did in some ways actually serve the interests of CNES, for example in acting as a buffer between the agency and the Budget Ministry's cost-cutting measures. The 'symbiosis' of DGE with CNES also benefited the latter in situations where a neutral chairman was required in negociations and where in the past the choice of CNES as the 'natural' expert arbiter had aroused resentment. Similarly, the restraining influence of the DGE profited CNES where the *Délégation* weighed against excessive enthusiasm for what turned out to some extent to be technical 'fads' such as hypersonic flight and microgravity.[33]

In terms of its own structures and of its relationship with the MRT, the DGE was also likely to expand, according to Jacques Serris. Seen from the standpoint of a *délégation générale* attached to a ministry dealing with stable long-term needs such as Posts and Telecoms (although as we have remarked their *institutional* stability is less certain), the MRT was perceived as being too much at the service of successive ministers with changing priorities, and thus unsuited to the strategic task of managing CNES and the space sector. On the other hand, the smallness of the DGE itself and its specialised field of responsibilty when compared with the Industry Ministry and the *Direction Générale de l'Industrie* sometimes handicapped it in negotiations with the giants of the space, defence, aeronautics, and electronics industries. For example, if the DGE was negotiating modification of a project proposed by CNES with *Thomson*, there was relatively little scope for making compromises on other dossiers pending with *Thomson* in exchange for concessions on the case in point because it would be unlikely that there would be many other projects with *Thomson* under consideration. In order to increase its weight in such affairs, and to give the *Délégué Général à l'Espace* as much influence as the *Directeur Général de l'Industrie,* it was thought that the DGE might well find itself pushed towards expanding its field of competence in directions more in accord with its long-term future, namely industrial affairs.

The stability of the DGE was not made any easier by the reorganisation of *tutelle* for space which occurred in 1991, when Prime Minister Rocard was replaced by Edith Cresson and ministerial responsibilities were rearranged.

7.4. The MELTE : Cressonian confusion ?

The early 1990s have been a particularly troubled time for CNES, and these troubles have been reflected in the various modifications to the *tutelle* of the space agency which have occurred over the period. The organisational aspects of *tutelle* tend to change most readily at moments when governments are changing or being reshuffled, and the misfortunes of the Socialists during the run-up to the second cohabitation between President Mitterrand and a right-wing Prime Minister gave ample political opportunity for the redrawing of ministerial responsibilities for space. Combined with these political uncertainties of ministerial continuity and change have been the technocratic pressures for the rationalisation of *tutelle* and control in the space sector, and for the simplification of relationships between semi-public entities such as *La Poste* and *France Télécom.*

The period between 1988 and 1993 can in fact be seen to be composed of two phases. The first phase is represented by the relative continuity of the three-year Rocard government, which lasted (with some intervening changes) from May-June 1988 to May 1991, and whose action in the field of space was to introduce the initial reforms of the MPTE, the *Comité de l'Espace* and the DGE detailed above. The second phase is made up by the governments of Edith Cresson, Pierre Bérégovoy and Edouard Balladur, whose modifications to the ministerial organisation of authority for space have not had the advantage of relative longevity enjoyed by Rocard.

The continuity and coherence of government action established in 1988 after the first cohabitation was disturbed in May 1991 by the replacement of Michel Rocard by Edith Cresson and the consequent redistribution of ministerial portfolios in June 1991. Under the short Cresson administration, *tutelle* for CNES was placed with the *Ministère de l'Equipement, du Logement, des Transports et de l'Espace*, (MELTE), with assistance from the *Ministère de la Recherche et de la Technologie*. The action of the Rocard administration between 1988 and 1991 has been studied above. Here, we propose to discuss the changes brought about in the ministerial governing of the space agency on the demise of the MPTE, in order to see what lessons can be drawn from this reorganisation of *tutelle* about the innovations of the Rocard government. As always, the different formats of *tutelle* for CNES during this period represent differing perspectives on the 'interministerial' nature of the space effort.

7.4.1. The MELTE : the 'diversification' of *tutelle* for space 1991-92

The MELTE is an example of government confusion rather than vision in the attribution of *tutelle* for space. The Rocard administration had recognised the need for effective and innovative ministerial management of both CNES and the space sector and of the Posts and Telecommunications sectors to which space had become tied. The Cresson interim period between Rocard and Bérégovoy was one in which government, (beset by economic and other problems), failed to capitalise on the completed transformation of *La Poste* and *France Télécom* into public sector entities by continuing its modernisation of the *tutelle* of space.

Edith Cresson was particularly concerned during her period in office by the problems of French high-technology industries in competition with Japanese and American dominance. The Cresson government launched two plans to help French industry become more competitive : the first of these plans concerned small and medium-sised firms (les PME/PMI); the second concerned the

stimulation of high-tech industry in general and the electronics industry in particular by the creation of a giant French public sector consortium similar to Toshiba through the merger of the civil electronics division of Thomson Consumer Electronics SA and an industrial subsidiary of the *Commissariat à l'énergie atomique* (CEA).[34] The creation of what was to be known as Thomson-CEA-Industrie was problematical, to a large extent because the merger reflected the political desire of the Prime Minister's office to subsidise the volatile, struggling and potentially profitable electronics industry with funds from the more stable but somewhat un-enterprising nuclear sector.[35] Such a political desire for interventionism in industry, albeit what was presented as nothing more than normal free-market (if state-inspired) *rapprochement* between (admittedly public) companies was an example of a much discussed trend in French government back towards some kind of industrial policy in reaction against the liberal and neo-liberal tendencies of the 1980s.[36] The notions of industrial policy that were originated by the Cresson government concentrated essentially on the more efficient running of *'capitalisme d'Etat'* - in other words the management of public sector companies along private sector lines. As the problems of organising the merger between parts of Thomson and the CEA continued during 1991 and 1992, the government began to consider other ways of managing the sclerosis of the CEA, one of which was its transformation into an *établissement public à caractère industriel et commercial* along the lines of the example offered by CNES.[37] This plan, although reaching the stage of a *projet de décret* was nevertheless eventually shelved in favour of a modified merger between parts of the CEA and Thomson.[38]

Within such a context of concern for high-tech industry and government policy to encourage France's competitive position, the attribution of responsibility for CNES to the MELTE might appear somewhat inconsistent. It is significant to note however, that the one element of continuity existing between the MPTE and the MELTE was in fact the space portfolio (accompanied by the DGE), and the Minister (Paul Quilès) himself. Such a concern on the part of government to protect the ministerial follow-up of the space sector reflected the importance of space as a contributing sector to *'équipement'* (or infrastructures) in the widest sense. Quilès was himself anxious to stress the 'coherence' of his ministry and also the manner in which the various portfolios over which he had overall authority were all important in the everyday lives of French people.[39]

7.5. Conclusion

As we have seen, the MPTE was replaced in May 1991 by the *Ministère de l'Equipement, du Logement, des Transports et de l'Espace* (MELTE) during new Prime Minister Edith Cresson's reshuffle of ministerial responsibilities. The new ministry (and the DGE) with Paul Quilès retained as Minister continued to exercise *tutelle* for CNES with assistance from the *Ministère de la Recherche et de la Technologie*. The disappearance of the MPTE, and the end of the Rocard government provides a convenient point for reconsidering the implications of the MPTE/DGE for the making of space policy.

The history and workings of the MPTE and the DGE are more complicated than the institutional innovations of 1988 and 1989 would give to believe on first examination. The motives and manner of their creation as well as their stated missions and organisation reveal various features of French space policy in the short- and longer terms. The shift of ministerial responsibility for space from the Industry and Research Ministries to a Ministry of Research and Technology and the MPTE aided by the DGE reflected the continuity of the French state's traditional interest in Space. Moreover, the addition of the DGE (and the *Comité de l'Espace*) to the panoply of institutions exercising some degree of control over CNES marked a new desire on behalf of the state, namely that of checking more closely on CNES activities. The *Comité de l'Espace* represented a move away from the monopoly of expertise on space matters held by CNES during the long period in which CNES was simultaneously the proposer of policy to government and the only body sufficiently well informed about space to give an assessment of the worth of such policy. Along with the *Délégation générale à l'espace*, the *Comité de l'Espace* showed how government was concerned in the late-1980s to strengthen its control over the definition and execution of policy by by-passing the stranglehold on policy proposals and programme evaluation held by the national space agency.

The state's desire for the continuity of the space effort and for increased control of the then rapidly developing space sector was mirrored in the missions of the DGE, organizing interministerial cooperation on the one hand and overseeing the application of short-term policy on the other. The MPTE and the DGE were set up in order to manage the tensions inherent in the space sector between a powerful space agency, industry and government. Given the nature of the situation, defined by the evolution of the general economic climate and by the development of the space sector itself, the partnership between the MPTE and the DGE can be viewed as an intelligent tactic for controlling these tensions. It has

been mentioned above that there are two apparent explanations for the merger of the Posts/Telecommunications and Space portfolios: firstly that these complementary services and applications were brought together in the interests of administrative synergy, or secondly, that the merger was a happy coincidence determined by the desire to rectify past budgetary practices, (the 'de-budgetisation' of the funding for CNES), rather than by a real strategic vision. On closer inspection, the merger of responsibilities in the MPTE appears as the first step in a longer-term strategic process of separation aiming at freeing all the component elements of the Ministry (not just reforming the statutes of *La Poste* and of *France Télécom*, but in so doing also freeing the DGE and *tutelle* for space in general from other government responsibilities).

In this interpretation of the situation, the MPTE was created as a temporary tactical feature of the long-term management of the space sector. Against the background of the evolving structures of the MPTE the separate structure of the DGE represented a certain permanence. In addition, the permanence of the institution as a *délégation générale* was complemented by the flexibility of its operational ethos which theoretically allowed it to manage conflict without provoking rejection. With the expected eventual disappearance of the MPTE in its original form, the DGE was to be in a position to maintain its rôle and influence and to continue applying the French state's long-term strategic vision for the space sector.

Most importantly, the long-term trend of government direction of the affairs of CNES has become increasingly one of regulation or control, and decreasingly one of confidence in the automatic conjunction of the best interests of the state and those of a loosely supervised scientific-technical agency. The experience of modifications in CNES statutes reveals how intervention has aimed at directing activities and also at limiting them in order to curb the influence of the space agency over its political authorities. In the face of changing policies on science and technology, whether 'liberal-free market oriented' or 'dirigiste-interventionist' in inspiration, the permanency of CNES as an institution has enabled the ratchet effect to work. The importance of *'cohérence'* exemplified by the creation of the MPTE (and of the *Comité de l'Espace*) and of *'contrôle'* manifested in the setting up of the DGE show how the pro-active rôle of government is perceived to be increasingly necessary in the state management of space agency activities.

The final chapter of evaluation which concludes this thesis will examine the patterns of *tutelle* for CNES which emerged during 1992 and 1993, representing the 'final version' of the Socialist governments' management of the space sector and the first attempt at dealing with CNES and space policy made by the new

centre-right majority. Briefly, these changes were as follows. Upon the departure of Edith Cresson after only a year as Prime Minister, and the arrival of Pierre Bérégovoy at Matignon, the ministerial authority for the space sector regained a measure of apparent coherence with the creation of the *Ministère de la Recheche et de l'Espace* (MRE) which alone exercised responsibility for CNES between April 1992 and March 1993, when the *tutelle* of the agency was importantly extended to include the Ministry of Defence. The second period of *cohabitation* between Mitterrand and the neo-liberally inspired Balladur government (1993 onwards) produced the innovation of a three-way split in the *tutelle* for CNES by retaining the Ministry of Defence, reintroducing industry in the form of the *Ministère de l'Industrie, des Postes et télécommunications et du Commerce extérieur* and also reinstating research in the guise of the *Ministère de l'Enseignement supérieur et de la Recherche.*

In the next major section of the thesis however, we look at the military inputs to the making of French space policy, specifically the contributions to the elaboration of the overall space effort which derive from defence policy and deterrent strategy, from the military establishment's space bodies, and from the industrial development of military space systems.

Notes to Chapter 7.

1 Under the terms of decree 88-741 (3 June 1988), the Posts, Telecommunications and Space Ministry was to perform the same rôle as the previous PTT Ministry alone. Décret 88-741 du 3 juin 1988, Journal Officiel 4 June 1988, p.7659.

2 Article 1., decree 88-741. In July, decrees 88-837 and 88-838 (20 July) finalized the new context with the definitions of the responsibliites of the Research and Technology Ministry (MRT) and its relation to the PTE Ministry (MPTE) and CNES.(Décret 88-837 du 20 juillet 1988, Journal Officiel 22 July 1988, p.9489. Décret 88-838 du 20 juillet 1988, Journal Officiel 22 July 1988, p.9490). Decree no. 88-838 presented the attributions of the newly recreated Ministry of Research and Technology (88-837 merely reaffirmed the responsibility of the MPTE already defined in 88-741 of 3 June 1988. The MRT was to exercise joint *tutelle* of CNES with the MPTE and, in the field of the civil research and technological development budget (BCRDT) the decisions relative to the attribution of funding for space research were to be shared with the MPTE as well as the customary negociations with the Finance, Economy and Budget Ministry.

3 Décret 88-741 du 3 juin 1988, Journal Officiel 4 June 1988, p.7659. Décret 88-837 du 20 juillet 1988, Journal Officiel 22 July 1988, p.9489.

4 Décret 88-838 du 20 juillet 1988, Journal Officiel 22 July 1988, pp.9489-90.

5 Décret 89-77 du 6 février 1989, Journal Officiel 8 January 1989, p.1810.

6 The DGE was created by decree 88-1121 of 14 December 1988, the post of *Délégué Général* being filled in early January by the appointment of *Ingénieur Général des Télécommunications* Michel Petit See Décret du 6 janvier 1989 portant nomination d'un Délégué général à l'Administration centrale, Journal Officiel 7 January 1989, p.297. The *Comité de l'Espace*, directly attached to the Minister for Space himself, was set up by Decree 89-508 of July 19.

7 As we have seen, the inputs from the Quai d'Orsay in particular are relatively minor except in their significance for the more intangible aspects of Grandeur.

8 The desire to control the space sector has been a constant of public policy. The traditional priority was to encourage and then to direct the sector. Financial constraints in a mature sector transform these priorities into direction and control.

9 Quilès replaced Charles Hernu as Defence Minister after his resignation over the Rainbow Warrior scandal.

10 Décret 88-1121 du 14 décembre 1988, Journal Officiel 16 December 1988, p.15713, modifying Décret 86-129. ('L'organisation de l'Administration centrale du Ministère des PTT').

11 For the terms of the creation of the Comité de l'espace and its brief, see Décret no. 89-508 du 19 juillet 1989, portant création du Comité de l'espace, Journal Officiel de la République française, 20 juillet 1989.

12 Décret 89-508 du 19 juillet 1989, Journal Officiel 21 July 1989, pp.2510-2511.

13 In terms of administrative practicalities, the Committee meets at least twice yearly at the demand of the Space Minister to discuss an agenda prepared by the Ministry. The Committee is serviced by a Secrétariat provided by the DGE and CNES

14 Décret 88-1121 du 14 décembre 1988, Journal Officiel 16 December 1988, pp.15712-15713.

15 *Elle mène les études et prépare les actions nécessaires pour assurer la cohérence de l'action gouvernementale en matière de politique spatiale. Elle prépare les réunions convoquées à cet effet. Elle assure le secrétariat et le suivi de ces réunions. Elle coordonne la représentation du Ministère dans les instances nationales et internationales ayant compétence en matière d'espace. Elle assiste le ministre pour l'exercice de la tutelle sur le Centre national d'études spatiales.* Décret 88-1121, article 19 bis.

16 Décret du 6 janvier 1989, Journal Officiel 7 January 1989, p.279.

17 To which he had been appointed on 8 June 1988 in replacement of Jean-Paul Vautrey

18 Details based on interview with Michel Glass, 28 May 1990, DGE.

19 The fact that Glass comes from a scientific-technical background with the CNRS is important in that it gives the DGE an opinion from outside the CNES-trained mafia of space industry contacts.

20 Interview with Michel Glass, 28 May 1990, DGE.

21 See also thesis chapter on 'CNES and government' dealing with the Finance and Budget Ministries.

22 This 'independence' of outlook can of course act in a different way, as is the view of financial controlling authorities, who point out that scientists are ipso facto convinced of the value of science.

23 Organisation de la DGE, (MPTE, 20 January 1989).

24 Organisation de la DGE.

25 Based on interviews at the DGE, 28 May 1990.

26 *Arianespace, SEP, Matra, Thomson, Aérospatiale.*

27 Interviews, DGE, May 1990.

28 Interview with *Inspecteur Général au CNES* Jean Gruau, November 1989.

29 The expression used was *'raisons de technique budgétaire'*, interview with *Vice-Délégué général adjoint* Jacques Serris, 28 May 1990.

30 For a treatment of the concept of *'budget annexe'* see Lequeret, Pierre, Le Budget de l'Etat: préparation, exécution, contrôle (Documentation française, 1982), p.23, and Les Notes bleues Budget 1990, numéro spécial 488, (Ministére de l'Economie des Finances et du Budget, 1990), pp20-21.

31 Interview, Edwige Bonnevie, DGA/DEN, 3 May 1990.

32 Interview, DGE, 28 May 1990.

33 Serris's criticism was of what he described as *'l'effet mode'*.

34 See Bréhier, Thierry, 'Un plan Cresson pour sauver l'électronique', Le Monde, 19 December 1991.

35 See Gay, Pierre-Angel and Monnot, Caroline, 'Le délicat montage de Thomson-CEA-Industrie', Le Monde, 4 February 1992.

36 See, for example, Le Boucher, Eric, L'industrie redécouverte: une nouvelle ambition, Le Monde, 15 November 1990, and L'industrie redécouverte: une compétitivité recouvrée mais des retards à rattraper, Le Monde, 16 Novemebr 1990; Colletis, Gabriel, A quel Saint-simon se vouer ?, Le Monde, 12 June 1991; Levet, Jean-Louis, Définir une nouvelle stratégie, Le Monde, 12 June 1991; and Muet, Pierre-Alain, La redécouverte de l'Etat, Le Monde, 17 December 1991;

37 Un projet de décret redéfinit les missions du CEA, Le Monde, 20 August 1992.

38 The grand plan of Mme Cresson to create a French Toshiba or Siemens from a merger between Thomson and CEA-Industrie was eventually modified to a more modest 'partial' solution in which the electronic components division of Thomson was joined with CEA-I and France Télécom. See Gay, Pierre-Angel, and Monnot, Caroline, Le gouvernement marie les composants de Thomson avec le CEA et France Télécom, Le Monde, 11 September 1992, p.15.

39 See Faujas, Alain, Les grands chantiers de M. Quilès, Le Monde, 13 September 1991, p.21.

Section III THE MILITARY SPACE SECTOR : STRATEGY, ORGANISATION AND PROGRAMME DEVELOPMENT

The third major section of the thesis looks at the military space sector, analysing the interaction between strategy and the technological requirements of the armed forces, describing the functioning of the military space 'system' in the defence establishment and investigating the industrial development of the satellite and missile programmes.

The military establishment, nuclear strategy, defence policy in general and the space industry are inextricably linked by the simple fact that nuclear warheads rely on ballistic missile vectors to deliver them to their targets. Targeting is indeed more and more reliant on space based navigation and position information, and SDI opened the perspective of truly militarised space, thus adding a properly spatial dimension to strategy.[1] On a common-sense level, it can be asserted that defence policy in the nuclear state has considerable implications for the rate and direction of development of the space industry through the stimuli to industry given by military requirements and research.

Various studies have dealt with the 'A' and 'H' bomb warhead development programmes and with their subsequent production and miniaturisation. Similar analyses of their delivery systems are sadly lacking, with the early exception of Judith H. Young's 1967 Adelphi paper on The French Strategic missile programme, which is nevertheless technical and descriptive in approach.[2] Our analysis places military space system technology procurement within the triple context of strategy, of the administrative organisation of the space structures, and the industrial production of satellites and missiles.

In this first chapter of the third section of the thesis, we will examine the input of nuclear strategy in particular (and to a lesser extent of general security policy) to the formulation of military space policy, in order to see the functioning of this element of the overall French space effort.

Chaper 9 will then look at the organisation of French military space in order to arrive at an understanding of how the structures of the defence establishment's military space bodies influence the making of policy and its implementation.

Finally, Chapter 10 examines the the implementation of military space policy through an analysis of the theory and practice of military space procurement.

Overleaf, Chapter 8 discusses the gradual move of French defence towards a deterrent posture based on nuclear weapons and *space systems*.

8. Strategy 1981 - 1992 : Towards '*une dissuasion nucléaro-spatiale*' ?

The 1980s produced a new strategic environment for the French *Force de Dissuasion* which placed strategists and technologists in the difficult position of adapting rapidly to the new and future parameters of national military security. The cause of this new techno-strategic environment was of course the Strategic Defense Initiative proposed by President Reagan in March 1983. It would be misleading to believe that French interest in military space dates only from 1983; as a later section on current military space programmes will show, there was a certain amount of interest in concepts and studies in the early 1980s and before. However, it is true to say that SDI caused a crystallisation of ideas in the minds of military planners and technologists and a focussing of the realisation that French military space activities had perhaps been neglected in the past, and more worryingly, that a new context was already developing.

By 1985, two years of action later, French attitudes towards SDI itself and towards the measures needed to protect French defence interests had settled somewhat. The still considerable debate about space and its military, industrial and commercial consequences for France was reflected by the ENA Conference on *'L'Espace, un Défi pour la France'*, held in November 1985.[3] The many expert contributions to the procedings provide a valuable cross-section of attitudes, both official and personal, but the official line towards military space activities had already found its essential form, expressed after the conference by *Ingénieur en chef de l'armement* Jean-Yves Leloup, who declared that French military space options were militarily and strategically determined by France's primary military objectives, namely the continuation of French deterrence and the ability to manage crises.[4] Thus stated by the director of the high-level Defence ministry *Groupe de Planification et d'Etudes stratégiques* (GROUPES), the closeness of the links between the development of military space technology and the growth of the space industry was plainly evident.

The structure of the Chapter will be as follows:

8.1. 1981-1992 - a brief chronology : the New strategic environment
8.2. Militarisation of space, disarmament and French nuclear strategy
8.3. Military space : problems and benefits for French defence ?
8.4. The lessons of the Gulf War
8.5. Conclusion

Before looking in some detail at the strategic challenges concerning space confronting France in the 1980s, it is useful to consider a brief overview of events relating to space activities in the Mitterrand years.

8.1. 1981-1992 - a brief chronology : the New strategic environment

The period can be divided into three or four key moments. 1981-83 appears as a time of relatively little positive action towards the use of space for military purposes, partly a continuation of the lack of enthusiasm of the previous administration and partly a consequence of the 'settling-in' period required by the Socialist government. In contrast to this apparent lack of interest in military space, civil science and high technology were given considerable attention, reflected by the creation of the 'super-Ministry' of Science and Technology under *Ministre d'Etat* Jean-Pierre Chevènement, and by increasing state funding for CNES.

March 1983 saw the shock to European science, technology and defence of SDI. President Reagan's proposals caused mitigated consternation in Europe on the political and industrial levels as well as in terms of defence strategy. Fear that anti-missile defences would alter the deterrent balance was accompanied by concern that the stimulus given to American science and industry by SDI contracts would lead to an increasing technology 'gap' between the US and Europe. Both these concerns were felt to give rise to the risk of a vassalisation of Europe to the United states either through 'simple' military-technical-industrial isolation or through an inferior partnership with American efforts. This period saw a dual immediate response to the shock of SDI from the French. Firstly, they proposed French and European committment to the militarisation of space if necessary, and secondly, they suggested that Europe should launch a (theoretically) civil industrial research and technology programme to reduce the feared SDI technology gap.

1984-85 thus saw the setting up of relevant institutions in France and Europe. In February 1984 at the Hague, President Mitterrand aired the proposal that Europe should cooperate on a manned space station, on observation and communications satellites and computing.[5] In May 1984, the *Plan Pluriannuel Spatial Militaire* was approved by the Ministry of Defence, catering in the short- and medium-term for the development of space telecommunications and observation systems. Within the Ministry of Defence a number of new structures dealing with space were set up, including a so-called '*Etat-major de l'espace*'. On the civil level, the European Space Agency confirmed the objectives of the long-

term European space plan. These ESA programmes, in conjunction with the initiatives taken under the EUREKA project proposed by President Mitterrand in 1985 can be seen as the techno-industrial European answer to SDI.

1986 and 1987 witnessed the launching of military space programmes, and the provision of substantial increases in funding over the preceding period. From 1981 to 1986, finance for military space had fallen by 50%. The fruits of the 1983-84 *'prise de conscience* first came in 1987, with an increase of 145% in the *autorisations de programme* for space projects in the military space budget. This positive financial trend was confirmed in the 1987-1991 *Loi de programmation militaire* (voted in Spring 1987) which set out spending on military space hardware of 9.1 billion francs for the five year period. It was predicted that France would spend more on military space than on contributions to the ESA.[6] The past commitment to military space was then seen to have been deficient to the extent that it had almost ignored the development of the fourth *(spatial)* component of the nuclear force. It was originally intended that the strategic Mirage bombers, land- and submarine-based missiles should eventually be complemented by satellite systems. In the late 1960s General Ailleret had already reflected on the eventual *'extrapolation spatiale'* of the *Force de Frappe.*[7] In the 1980s, it was the rôle and usefulness of satellites in times of peace and war that was one of the major preoccupations of military space planners. In 1989, concern grew in some quarters that the strategic triad would eventually be reduced to a single arm (submarine) by the year 2000 because of the obsolescence of the airborne force and the delays in replacing the S-3 *Plateau d'Albion* missiles.[8]

In spring 1989 the Rocard government undertook a mid-point review of the *Loi de programmation* 1987-91, allowing the Finance ministry to demand considerable cut backs of the order of 70 bn francs in the planned major procurement projects, the necessity of all of which was being increasingly questioned.[9] The 'cut backs' were implemented through the procedure of 'rescheduling' the development of some of the projects, and so no major programme was cancelled, thereby postponing the making of real choices until the next *Loi de programmation.*

The concern over the confidence to be placed in the deterrent force which the review of the 1987 - 91 program law avoided addressing is not solely a consequence of the inadequacies of past commitment to military space, (a failing that appears all the more striking since, as ICA Leloup repeatedly stated in his contribution to the ENA debates, French space options derive directly from defence policy).[10] The new strategic situation threatened French independence of action on a number of levels, the most important of which were the military-

strategic, the industrial-technological and the political-diplomatic, (on the linguistic-cultural level, the French felt threatened by DBS television saturating Europe with American culture).[11] The demands made on the French space and associated high technology industries to produce hardware capable of allowing France to maintain her strategic position in the new post-SDI context posed with particular acuity the problem of *'coopération franco-française* (joint work between civil and military sectors), European collaboration, or partnership with the SDIO industrial complex.

In 1990 and 1991 the Gulf War and the problems of France's minor-partner participation in Desert Shield and Desert Storm reactualised debate in French strategic and political circles over France's ability to cope in modern warfare conditions dominated by satellite telecommunications and observation satellite intelligence gathering. The ways in which these questions were answered reveal the complicated mix of factors at work in the relationship between the state and space in France.

As a first stage in examining the military aspects of the making of space policy, we will now examine the strategic and technological challenges concerning space facing the French armed forces and industry in the 1980s.

8.2. Militarisation of space, disarmament and French nuclear strategy.

SDI was after all an Allied project, and as such did not pose a direct military threat to France (unless one retains a rigourous *'tous azimuts'* conception of the location of *'la menace'*), although it did destabilise the logic of deterrence. Thus on the military level, French reactions were a function of the strategic and technological changes that SDI provoked in potential agressors, to be clear, the USSR. On the civil level however, technological, industrial and commercial concern focussed on developments in the USA. Thus SDI combined both civil-economic-technological as well as military-nuclear-strategic features. Essentially, in the military field, the question hanging over French strategy was whether the potential development of a Soviet ABM capability would seriously affect the efficacity of the deterrent force. Whatever the extent of Soviet departure from the Moscow ABM Treaty of March 1972, there was a general consensus in France about the greater military importance of space, and general official confidence in the continued deterrent rôle of the FNS. Already at the ENA Conference, Ambassador Claude Arnaud, (advisor to the Minister of External Relations) expressed the conviction that space

would be extraordinarily important in strategic and military terms.[12] This statement of faith echoed the view expressed by the Head of State himself at the nuclear submarine base at *Ile Longue* in Brittany in May 1985 that *'la stratégie sera nécessairement spatiale dans le courant du XXIième siècle'*.[13]

Despite some doubts voiced by Arnaud and others as to the long-term viability of SDI projects given the hugeness of the operation and the vagaries of funding under the American democratic system, the 'worst case' scenario of weapons development meant that the French must act on the assumption that the US and the USSR would develop space-based defensive systems threatening the current technology and formulation of French nuclear strategy. The threats thus posed, which through the *'effet miroir'* determine changes in French technology and strategy concerned firstly *'la pénétration de nos forces'* and secondly the whole relationship between SDI, European security and the independence of the FNS. As Michel Duclos, (CAP-Ministère des Relations Extérieures) remarked in 1985 *: 'Ce n'est pas la fin de la dissuasion nucléaire, mais en même temps des défis nouveaux se présentent'*.[14]

We will first consider the credibility of the FNS in the face of potential Soviet technical developments and secondly the political viability of the FNS in the context of disarmament and moves towards common European security.

8.2.1. Credibility of the FNS.

Given the assumption that a Soviet anti-missile defence would be created, even an imperfect system would protect the superpower's second strike capability. French targeting policy was not directed at targets in the Soviet Union ensuring a second strike anyway, being based on the enlarged *'anti-cités'* principle.[15] There seemed thus to be relatively little call for France to attempt to emulate an SDI ABM system, partly because of the scale and cost of such a project, (beyond the reach of France), and partly because of the principle that French deterrence rested essentially on the capacity of its missiles to penetrate enemy defences and impose unacceptable losses, whatever the state of France's own defences. There was much lobbying for improving warheads and vectors to increase their chances of reaching their targets, as well as for finding ways of bypassing a Soviet ABM system, and Pierre Lellouche for example suggested that a considerable effort would be necessary in order to create new ballistic and non-ballistic weapons.[16] New non-ballistic systems would include cruise missiles or a new generation of strategic bombers, but whilst there was consensus and support for modernizing

missiles (the M-4 particularly), there seemed to be little overall agreement in this area.

Apart from missile modernisation, the principal concern of the French military was becoming the development of satellite systems and the ways in which these systems could improve France's deterrent stance. The details of the French attitude towards satellite systems exemplifies to some extent the double logic of a medium sised power attempting to manage a new techno-strategic context to maximise its own interests. The *'discours stratégique'* emanating from the military-diplomatic establishment stressed two themes : the reluctance of France to engage in the militarisation of space and her desire for a peaceful use of space; and secondly, France's capacity to defend her strategic interests if forced to do so by the regrettable actions of the superpowers. Charles Hernu, (Defence Minister May 1981- September 1985) demonstrated this complex attitude by declaring that France did not wish an ABM arms race but was perfectly ready to engage in one.[17]

The development of satellite systems was presented as a means to two ends in official discourse. Firstly, they were to complete and reinforce deterrence through allowing France to communicate via, observe, and take early warning from space. Secondly, they were to help to maintain peace through the dissemination of information about superpower arms activities to other nations. In either scenario, whether it were of France developing space systems capable of safeguarding her military interests against American SDI and Soviet ABM, or of the peaceful exploitation of space for disarmament, France was presented as being technologically or diplomatically capable of *leading* the developments. To a certain extent this was of course bluff and propaganda. We have already mentioned that few in France advocated a full-blown French SDI/ABM project or anything approaching it. Likewise, past French initiatives on the peaceful uses of space and restrictions on militarisation met with little encouragement from the superpowers. We will return to a discussion of French positions on *'l'espace pacifique'* after a brief presentation of the ways in which President Gorbatchev's own arms reduction onslaught on European defence affected the viability of the French strategic position.

8.2.2. Political viability of the FNS.

Technologically, the Soviet reactions to SDI jeopardised the operational credibility of the FNS. Diplomatically, as well as strategically, Soviet arms reduction negotiations in Europe created a context in which the backing for the FNS was conceivably weakening, or at least changing in content.

It would be easy to establish a substantial list of calls for European cooperation in conventional defence, in military high-tech, in military space activities and even in strategic defence, reflecting new doubt over France's capacity to 'stand alone'. Similarly, the demands of the disarmament process led in some quarters to the argument that modernisation of the French nuclear forces should actually be frozen.[18] The propaganda effect of Soviet disarmament initiatives was to create a climate of doubt in European society, particularly in West Germany, but also to a certain extent in France (a new development). In times of perceived (if not actual) arms reduction, social demand moves away from strong defence towards other desiderata, and some expert commentators believed that the twenty-year social consensus in France on foreign policy and defence might be coming to an end.[19] A survey of public opinion conducted by *Le Monde* with CSA-FR3 in May 1989 indicated a certain amount of confusion of ideas on defence : the Soviet threat was receding in the popular imagination at the same time as popularity of the FNS was increasing compared with 1977 and 1980.[20] Typically of popular imagination, a majority was in favour of the integration of the deterrent force into European defence *as well as* preferring the money spent on it to be invested in health and education. This confusion is perhaps inherent to opinion polls as a genre, but as Jacques Isnard (*Le Monde*'s defence expert), remarked, even among French political parties *'la dissuasion n'est plus forcément la Bible'*.[21] Already in 1986, Jolyon Howorth concluded an analysis of the resources and strategic choices open to French defence policy in the following terms : 'A combination of forces is urging France to accept that in the age of "Star Wars", national defence is increasingly illusory, if not actually meaningless. France's fate cannot be divorced from that of its European neighbours, but the obstacles to defence cooperation are formidable...'[22]. Furthermore, this study anticipated the break-up of the cosy political consensus of the illusion on 'defence on the cheap' as France moved into the 'post-deterrent' world.

Thus the implications of SDI and the new strategic environment it created addressed two major questions to France's position in the international system as guaranteed by the independent nuclear force. Firstly, there was a question mark hanging over the technical credibility of the FNS in the face of anti-missile systems and the potential deployment of counter force weapons. Secondly, the Soviet arms reduction offensive in Europe was creating the conditions for a reassessment of the rôle of an independent nuclear force in European security, which along with financial scrutiny of the Defence Budget in France itself contributed to undermining French efforts to maintain their rank in the world.[23]

The responses that France produced to meet these twin threats both included a spatial element. The technical credibility of the deterrent force was seen to lie essentially in the spatial modernisation of the French nuclear forces, and by the integration of new spatial considerations into French strategy. On the diplomatic and political levels of response to SDI, the militarisation of space and the arms reduction process, the French developed their lobbying for peaceful uses of space, a rhetoric designed to defuse criticism of France's own ('reluctant') moves towards military space activities, and to reinforce the image of France as an enlightened nuclear power. In this way a virtue was made of the necessity of developing military uses of space through declarations that such a project was easily enabled by the high level of French technology and industry, and that moreover, such modernisation would complete and complement the traditional deterrent strategy. Equally, a manifest virtue in terms of world opinion was made of the necessity to restrain superpower military ambitions in space by France's declarations in favour of peaceful exploitation of satellites. This rhetoric in support of ABM systems and against the development of ASAT technology was an important if secondary feature of overall space policy, illustrating French willingness to extract as much mileage as possible from all aspects of space technology and diplomacy.

Before looking at the spatial modernisation of strategy we will next examine how military space is alternately thought to provide problems and advantages for French defence.

8.3. Military space : problems and benefits for French defence ?

We will firstly examine initiatives in favour of non-military, peaceful uses of space coming from France, by which the French have attempted to influence the development of the militarisation of space. Secondly we will consider the more commonly held idea that space is a complement to the deterrent force.

8.3.1. *'L'espace pacifique'*[24]

France had been militating in favour of solely peaceful uses of space since 1978, when President Giscard d'Estaing presented the concept of an international observation satellite agency to the General Assembly of the United Nations.[25] This project for a 'Blue satellite', as it became known, provided for the extension to other countries of the space observation facilities at that time limited only to the superpowers. The French were particularly sensitive in the late 1970s about their

own dependence on American satellite information, (when such information was forthcoming), and about their inability to check or refute the data should it conflict with French interests. Since the SPOT programme was launched in 1978 it was presented in this light as a development breaking the superpower monopoly of space reconnaissance and thus contributing to the maintenance of world peace. (In fact, the project has also been presented as a means of predicting natural disasters, so it combines all possible virtues).[26]

Given the fact that the realisation of the importance of military space only really started crystalizing in 1983-84, the enthusiasm for these 'passive', 'para-military' uses of space observation, telecommunications and early warning for the international control of destabilizing situations may represent a genuine initial belief in such initiatives. The French proposals had been repeated at UNSSOD II by Foreign Minister Claude Cheysson (11 June 1982), who expressed France's willingness to join a general treaty prohibiting BMD.[27] At the June 1984 UN disarmament conference held in Geneva, Ambassador François de la Gorce presented a French proposition that antisatellite systems should be strictly limited, that ABM or ASAT lasers and studies should be banned for a five year renewable period, and that the superpowers should extend their private accord guaranteeing the immunity of certain satellites to the satellite systems of other nations.[28] These propositions avowedly had the dual ambition firstly of preserving the stability of the strategic balance, and secondly of safeguarding the civil-commercial opportunities of space exploitation.

The ambiguity of the French position (a consequence of trying to back too many horses at one time) transpired in a January 1984 *Défense Nationale* article by the senior *Délégation générale pour l'Armement* (DGA) officer ICA Pichoud in which he declared that military uses of space were minor in comparison with civil exploitations, but that to maintain credibility and to perfect techniques, the French space effort would have to engage in military applications.[29] Coming from the director of the *Groupe Espace-Satellites* of the DGA's ballistic missile directorate (DEN-STEN)[30], this apparent emphasis on the civil and political aspects of space technology was somewhat surprising, evidence of France searching for an effective argument on which to base her attitudes towards the moral and practical dimensions of the militarisation of space.

In May-June 1988, ten years after the initial proposal, France reiterated her support for the creation of an international satellite agency for arms control monitoring, an initiative paralleling the Western European Union (WEU) project for a similar European system for verification of arms control agreements.[31] The WEU considered the plan of using SPOT satellites (Alain SIMON of CNES

suggested a possible option of using SPOT 2/3 immediately, with relatively low definition data available to all countries, followed by SPOT 4 to be offered by France to the UN in 1992).[32]

At the same time as backing moratoria on ABM systems and ASAT measures in order to slow the militarisation of space, the French were busy integrating the spatial dimension into their nuclear strategy. As has already been mentioned, the official discourse on this process presents space as complementing and completing the FNS. Assuming the right hand of the French state knows what the left hand is doing, these attitudes might appear somewhat Machiavellian. Having looked at the diplomatic-military aspects of post SDI space policy, we will now examine the theme of space as a complement to the deterrent force - towards a *'dissuasion nucléaro-spatiale'* - the second of France's responses to the new post-SDI diplomatic-strategic environment.

8.3.2. Space as a complement to the deterrent force.

The complexity of the French reaction to the militarisation of space was representatively illustrated in ICA Jean-Yves Leloup's contribution to the ENA conference in November 1985. Entitled *'Les options spatiales françaises'*, this speech reached a much wider audience in the February 1986 issue of *Défense Nationale.*[33] Leloup defined the principal objectives of French defence policy as being the maintenance of the *Force de dissuasion* and of France's ability to manage crises, and stated that French space options must be consonant with the guaranteeing of these objectives. For Leloup this necessitated satellites and ground stations for observation, listening and communications from space, and secondly, measures to protect the FNS from militarised space. These applications were described as the *'utilisation militaire pacifique de l'espace'*, and were contrasted with the *'ambitions beaucoup plus démesurées'* of the superpowers, whose ABM research was presented as potentially destabilizing. Leloup's rhetoric is such that as well as stressing the 'peaceful'[34] nature of French military space, he also maintains that the French reply to SDI is not to be found in space : *'Quelle est pour nous la réponse à ces menaces? Elle ne se situe pas dans l'espace: il ne s'agirait pas pour la France de se lancer dans une opération du type IDS à l'américaine'*.[35] To complete the full range of official positions, Leloup also evoked the Geneva proposals made by France in 1984, before going on to state that France would also improve the penetration of her missile systems through hardening, multiple warheads and stealth techniques. His conclusion was that as far ahead as forecasts could be made, space would not undermine France's

nuclear deterrence.[36] These protestations of France's blamelessness and capacity to react reluctantly to the new demands are to be contrasted with the admission that space might indeed be a potential complement to deterrence.[37] Which gives a scenario something like 'We are against it. We can do it if we have to. It will be to our advantage to do it'... The situation was, however, more complicated than this view would suggest, even though strategically space has an undeniable complementary rôle to play.

For example, speaking at the *Cours supérieur interarmées* on '*Les perspectives d'utilisation militaire de l'espace*' in 1988, the senior DGA officer IGA Bousquet, *Directeur des Engins*, expressed his personal opinion that space was having some problems in being accepted into French military thinking *('l'espace a un peu de mal à s'intégrer dans la pensée militaire)'*.[38] Bousquet advanced operational factors (space systems would never replace the need for conventional forces), strategic considerations (in so far as space systems would always be vulnerable to the superpowers), and practical and financial constraints of what he considered to be the necessary separation of civil and military space as reasons for the problems of space strategy in military thinking.

Given that France considered SDI to be destabilizing, her political and diplomatic efforts attempted to limit this process and to dissociate France from its effects. Strategically, as Rear Admiral Alain Coatanéa, President of the *Groupe d'études spatiales* (GES - the highest level military space body), stated at the *Activités spatiales militaires* conference in October 1988, the military attitude towards space followed the traditional pattern for technological innovations : firstly the new technology is integrated with existing general strategic notions, and, secondly the armed forces attempt to use existing facilities, even if civil, attempting to adapt them to their own requirements.[39] (Operationally and industrially, the military space programmes treated in the chapter of the thesis devoted to the practical aspects of military space programmes show how far military space has profited from existing civil projects). Strategically (our concern here), despite the claim that SDI and the militarisation of space were destabilizing, the French also maintained that the situation nevertheless exhibited some stabilizing features exploitable in their own interests. Amongst these features Coatanéa listed early warning satellites providing improved chances of effective reprisals, greater reconnaissance information guaranteeing *'l'autonomie de la décision'*, the prevention of circumvention of deterrence through triggering of local conflicts, and finally, *'le contrôle des crises'* (political-military command communications).

These features illustrate the central notion integrating space with French nuclear strategy, namely that of space systems as a *'multiplicateur de forces'*.[40]

Considered in this way, military space applications stabilise the strategic environment through freedom of reconnaissance, and guarantee a near equality of chances (credibility) in the event of deterrence becoming war. Coatanéa's formulation of the importance of space to French defence policy prefigured the debate over military space stimulated by the Gulf War and many of the conclusions drawn in 1991 over the need to expand military space programmes. We will consider the effects of the Gulf War on French defence presently, but must here address a feature of the militarisation of space which was of concern to the French military during the 1980s. The element in the new strategic environment which integrated least easily into French military planning was antisatellite measures. ASAT appeared indeed as the joker in the pack, the only aspect of military space activities which threatened the continuation of the deterrent principle and France's claims to independence of action.

8.3.3. Anti satellite technologies (Asat.)

Between 1985 and 1987 a new concern arose in French military circles over the vulnerability of the deterrent force to anti-satellite measures, the principal fear from 1983 onwards having essentially concerned the ABM aspects of the space defensive shield proposed by President Reagan. (And anyway, before 1985 and the launch of the *Télécom 1* satellite with its military equipment piggy-backing on the civilian payload, France had no military satellites to worry about). Indeed, given the advanced state of American and especially Soviet Asat studies this potential threat to French independence of reconnaissance and communication was more direct than the eventual development of a more or less impermeable ABM defence. Analyses of the problem were forwarded at the ENA conference by François Heisbourg and by Jacques Battistella. For Heisbourg, the absence of a legal framework constraining Asat projects represented an open door to threats to the relatively few French satellites that would be operational at any time of crisis.[41] The development of Asat weapons targeting French satellites would imply great costs for the French space industry and French defence in hardening satellites against agression. Generalised research into Asat technologies might also, Heisbourg suggested, lead to a bypassing of restrictions on specifically ABM technologies. Furthermore, horizontal proliferation of the techniques of satellite destruction might lead to an undermining of the strategic balance.

Battistella's understanding of the implications of Asat technologies can be opposed to that of Heisbourg to the extent that, interestingly, he saw them as a possible 'lever' enabling France to maintain her strategic position in the

international system: *'pour une puissance moyenne comme la France ou l'Europe, les Asat pourraient remplir un rôle de dissuasion du faible au fort, comme l'atome'*.[42] Since the superpowers rely heavily on highly expensive satellites to maintain their military security, Battistella's notion was that the potential destruction of these satellites by a third power would exert a dissuasive influence. This use of space as an active element of France's deterrent was conceptualised in terms which evoke the development of the *Force de Frappe*, and which suggest that space is a technology whose military applications can work in France's favour in the same way as the possession nuclear weapons allowed France to dialogue with the superpowers in the 1970s.[43]

The suggestion that Asat weapons could provide a way for France to shift her deterrence into space through a displacement of the concepts of *'la dissuasion du faible au fort'* and of *'l'ultime avertissement'* into Clarke's and other orbits, revolutionary and appealing as it might initially appear, was not accepted by other French defence analysts. For instance, Marisol Touraine, writing in early 1987 arrived at very different conclusions concerning advisable French attitudes towards Asat.[44] Touraine's analysis was based on the identification of Asat weapons as a strategic and not merely technological challenge and yet concluded that the course of action most appropriate for France was to consider the use of Asats in a battle rather than a deterrent context. Because of the great disproportion between the numbers of French and Soviet satellites, the principle of deterrence *'du faible au fort'* although quantitatively present would be inoperable in space since France would never have *enough* satellites or Asat systems to hinder enemy actions, and the converse *a fortiori*. (The fact that the Soviets could replace satellites in matters of only a few hours would also seemed to invalidate this concept).

The transfer of the 'final warning' into space was likewise rejected by Touraine, since she argued that the explosion of a nuclear satellite in a French Asat action would not only probably damage friendly satellites, but that such an act through its nuclear nature would confuse the credibility of the distinction between battle tactical/pre-strategic and space-strategic engagement. Because of these problems, Touraine's recommendation (not shared by some of her colleagues at the SGDN)[45] was that France should integrate her military response to an eventual attack on her satellites with her *'stratégie d'emploi aéroterrestre'*, thus maintaining the coherence of the deterrent system. Once French satellites are understood by the Soviets as merely one element of the French C3I system, attack on them can be answered by a conventional strike against Soviet satellite ground stations. The implications of Touraine's analysis for the French space industry was that Asat weapons development should not be proceded with immediately, but that *'veille*

technologique, diplomatie active et préparation de représailles éventuelles'[46] would enable France to adapt to a variety of situations, and to rapidly develop Asat capabilities should the need arise.

In conclusion to this analysis of France's attitude towards the militarisation of space in the 1980s and the effects of these strategic considerations on the militarisation of French space activities, we can state that *the new situation of the 1980s created an arena in which France could attempt to exploit developments to her own best advantage.* The spur to military space given by SDI created a relative consensus behind the idea that the armed forces required spatial modernisation in order to maintain their technical credibility. In parallel, on the diplomatic level, the French were careful to maintain a 'double discourse' on the militarisation of space, simultaneously decrying the move towards any kind of 'Star Wars' and stressing France's strategic and industrial capability to answer any threat this might pose to the 'independence' of France within the international system. Both these features of the spatial modernisation of the armed forces combined to allow the space lobbies within the armed forces to expand and strengthen their organisation and influence and also to launch procurement programmes such as *Syracuse* and *Hélios* which exemplify the closeness of the links and *'imbrication'* between the military and civil space sectors. These programmes and links will be discussed in Chapter Ten, but here we shall conclude this appraisal of the links between defence strategy and space with a discussion of the implications of the Gulf War for the French armed forces. In 1990-91 and afterwards the development of strategic thinking on French military space was further stimulated by the Gulf War and by the lessons learnt from the conflict both in general concerning the nature of such operations, and in specific terms concerning the experience of the French forces involved, and of France as a minor partner in the Desert Shield / Desert Storm alliance.

8.4. The lessons of the Gulf War

The Gulf War caused the French military-political establishment to reflect upon France's traditional security stance and the strategic, technical and industrial principles which underlie French geo-political action. The Gulf War added to calls for a rethinking of defence which had already arisen after the changes in Eastern Europe and the perceived possibility of a 'peace dividend'. In the terms of François Heisbourg, director of the IISS, the strategic changes consequent on the end of the Cold war and the implications of the Gulf War made an 'aggiornamento' indispensable for France if she were to avoid the unusual danger of being *'en*

retard d'une paix' (end of cold war) and *'en retard d'une guerre'* (unprepared for subsequent conflicts).[47]

The simplest lesson that France drew from her experience of the Gulf War and which was perhaps the fundamental stimulus for the reassessments of policy and structures which ensued was that she had been shown to be a very minor partner in the US-dominated Operations Desert Shield and Desert Storm, because of deficiencies of equipment on the ground and because of problems of communication and intelligence. Given France's traditional aspirations to autonomous and wholly credible military capabilities, one might expect that the normal reaction to such a position of inferiority within an alliance would be calls for improvements in matériel and support, and this was indeed the case. However, the Gulf War also demonstrated the immense cost of playing an autonomous and credible military rôle in the contemporary world. If the cost of the operations can be taken as the second lesson of the war, then the two lessons combined led France to the realisation that a reassessment of her traditional security stance was necessary, and that it should be defined in terms of credibility and cost rather than in terms of pure 'autonomy'.

8.4.1. Military space and the new debate on Defence

The end of the war provided an opportunity for the President of the Republic to call for a debate on the definition of a new *'politique militaire'* (3 March 1991) in addition to the examination by Parliament of the *projet de loi* sur *la programmation militaire* for 1992-96. Mitterrand's initial suggestion, made during a televised address to the Nation, was that France's defence system (*'appareil de défense'*) should be modernised without any modification to strategy. Alongside the modernisation, (or perhaps as an unavoidable element of such modernisation), Mitterrand called for changes in the nature, composition and balance of the French armed forces overall.[48]

Amongst many distinguished participants in the debate on France's security policy during 1991 was Henri Martre, the managing director of Aérospatiale, who contributed an article to *Le Monde* entitled *'Les samouraïs et les marchands'*.[49] Such a title was chosen to reflect the twin temptations of French thinking on military matters, namely that France can be a kind of 'samurai nation' in the world community by virtue of her nuclear deterrent, and a major merchant of arms, but Martre's conclusion was that *given France's size and resources*, she can play neither rôle completely and should capitalise on her strengths, such as high technology, in order to play an influential part in world politics.[50] Also addressed

by Martre in his analysis of the issues of the security debate was the question (central for many commentators) of the future of the French nuclear deterrent. Perhaps unsurprisingly, as managing director of the main producer of the deterrent force vectors, Martre was in favour of maintaining the rôle of the FNS as the ultimate guarantee of France's 'vital interests' against attack from any quarter and in any form, nuclear itself or not. Such support for the FNS (and for any - *spatial* - modernisation necessary to protect it) is justified for Martre by the logic of France's nuclear capability and by the favourable cost-efficiency ratio of nuclear arms in ensuring security.[51] In the recessionary context of the Gulf War period, marked in France by the Rocard government's increasing difficulties to manage the conflict between falling revenues and rising expenditures, the cost of security was the basic key to the debate that arose on French defence.

Since the Gulf War stimulated re-opening of debate on France's security options, the *loi de programmation militaire* has been the object of considerable conflict and confusion, resulting in the abandonment of a traditional five year plan and the consequent definition of spending ambitions for the armed forces on an annual or two- to three-year basis. Even before the impact of the Gulf War, the French armed forces had been moving towards an updating of some of their structures within the framework of Defence minister Chevènement's *loi de programmation* 1990-93 and the Armées 2000 plan, whose rationale had been the slimming down of the armed forces and the search for greater efficiency. Some of the decisions taken during the 1991 debate over the rationalisation and modification of the defence system were thus inherited from Chevènement, such as the abandonment of the S 45 ballistic missile, the planned reduction of the professional army from 280,000 to 230,000 over a six year period, the planned reduction of military service to ten months and the creation of a joint Franco-German unit.[52] In addition to this rationalisation, which had been stimulated essentially by the developments in Eastern Europe, the Gulf War provided a realisation that the armed forces required *modernisation* and reorganisation just as much as rationalisation.

8.4.2. *Loi de programmation* 1992-94 : economies and diversified priorities

The *loi de programmation* as it finally emerged from government in July 1992 after a long period of gestation demonstrated the desire to limit increases in spending. At the same time as a slowing in the increase of funds, the programme law aimed at a 'rebalancing' of the allocation of funds within the defence system, doubtless in answer to President Mitterrand's call for a debate on the 'internal equilibrium' of the

armed forces. This rebalancing of priorities concerned most importantly the place of the nuclear forces within the defence system. For the first time, the *loi de programmation* for 1992-94 and 1995-97 provided for an actual decrease in the funding allocated to the nuclear forces, and significantly, substantially rising investment in the spatial components of France's defence.[53]

These decisions to give extra funding to space gave effect to opinions voiced in May 1991 by Defence Minister Pierre Joxe, who described the 'extreme dependency' and the 'feebleness' of French intelligence during the Gulf conflict, inadequacies which, in the view of the Defence ministry, would have left the French forces 'almost blind' had they not been aided by other Alliance partners.[54] This problem was to be addressed by Joxe through the planned transformation of French military intelligence into a full *'arme'* (or corps) of the armed forces, in order to reflect its new *'dimension stratégique'*. Such a reorganisation of the structures of intelligence gathering, and the increased prestige of the activity within the armed forces was intended to improve the efficiency of information gathering and communication, along with an effort to improve the technical endowment with which the intelligence personnel gather and diffuse information.

Although Joxe stressed that *'fascination technologique'* was not the only answer to the inadequacies of the system, it became obvious that space observation and communications capabilities such as those that had enabled the Americans to see and talk during Desert Shield and Desert Storm were considered to be essential to proper French independence of action in conventional operations. As Joxe was reported as stating in his speech to the *Institut des Hautes études de défense nationale* (IHEDN), a situation in which France depended on the good will of the US for information was unacceptable : *'Ce sont les Etats-Unis qui nous ont fourni, comme et quand ils l'ont voulu, l'essentiel des informations nécessaires à la conduite du conflit'*.[55] The conclusion that the Defence minister drew from this unhappy situation was that for the same reasons that had led France to develop an autonomous nuclear deterrent in the 1960s and 1970s, an independent space surveillance capability should now be acquired.[56] The importance of these measures is underlined by the fact that they were the first to be proposed by Joxe after his arrival at the Defence ministry in January 1991 to replace Jean-Pierre Chevènement, and the terms in which they were expressed suggested that space was indeed likely increasingly to become of extreme importance to the French armed forces.

8.5. Conclusion

French strategic thinking has been forced by the Gulf War into recognising the fundamental importance of space-based systems in the conduct of modern warfare and the necessity for France to develop such systems. The importance of the systems is not a new idea, since even in the 1960s, strategists in France and elsewhere speculated on the eventual need for satellites as complementary elements in nuclear deterrence, but dependence on the US in Desert Storm and the new strategic context of the post-Cold war period has forced France into realising that the time has come to develop such capabilities fully.[57] Given France's traditional military-diplomatic stance, the development by allies of a spatial element to conventional warfare and nuclear strategy is doubly galling, especially if (as has been reported) President Mitterrand's request to retain US satellite photographs of the Gulf conflict was refused by the American officer who had brought them to the Elysée.[58] The feeling that military space technology is crucial if France is to maintain her rank in the international concert of nations was expressed neatly by a contributor to the review Défense Nationale in February 1992, who stated that in an ever more dangerous international system French defence could only deteriorate without investment in space, leaving France's national deterrent force grounded and dependent on the '*système nord-américain de guerre assistée par ordinateur.*' Moreover, and more immediately to the point for the making of military space policy, *'Un plan de rattrappage est impératif, comme le fut en son temps le plan atomique, ne serait-ce que pour le renforcer'*.[59] The final comparison between the atomic weapons development programme of the 1950s and 1960s and a plan for France to 'catch up' in military space capabilities is an illuminating insight into the importance military space is assuming for the French armed forces.

The changing strategic environment of the mid- and late 1980s and the difficulty of forseeing strategy in the 1990s have combined to force modernisation and rationalisation on the French armed forces. Most recently, Defence minister Joxe's principal strategy in 1991 and 1992 was to develop the panoply of space-based technology at France's disposal *as a complement to the FNS* and also as a means of improving France's independence of decision and action. In terms of programs, this has translated itself in the continuation of the *Syracuse* program, the extension of the *Hélios* series of satellites, the initiation of two new satellite programs named *Osiris* (radar) and *Zénon* (electronic listening), and the planning of a second generation optical observation satellite named *Songe*. These programmes combined national self-reliance and increasing openness to

European partnership. Pierre Joxe's enthusiasm for the spatial modernisation of the armed forces thus echoed some opinions voiced in the 1980s, when European collaboration was seen as a possible future for French industry and military influence (once the possibilities of national civil-military cooperation were exhausted), but when hopes for joint space programs were tempered by the failure for political reasons of past collaborations.

Strategic thinking and defence policy in general have thus provided a strong source of discussion of military space, and especially in the later 1980s and the early 1990s, a strong impetus to the expansion of military involvement in the industrial development of applications programmes such as communications and observation satellites. As French deterrent strategy has moved towards a kind of 'dissuasion nucléaro-spatiale' and as conventional conflicts such as Chad and the Gulf War have emphasised the need for French forces to *'voir, écouter et communiquer'*, military space structures have evolved within the defence establishment to initiate policy and protect the interests of military space.

It is to the consideration of the organisation of French military space activities that we now turn in order to show how the military space sector tries to resolve its internal tensions between technicians and strategists and the external tensions existing between military space and civil industry and government. Issues of power and control are to be found on two levels, namely that of the *Etat Major des Armées* (EMA) and that of the State-space sector interface.

Notes to Chapter 8.

1 Even in the pre-SDI period of 1975-1980 70% of satellites put into orbit were military in character, and many currently operating 'civilian' satellites carry special cartridges serving exclusively military purposes. Space exploitation can be regarded as a non-specialized defence good or service, since space can be used for civilian purposes as well as by the armed forces. Kennedy, G., Defence Economics, Duckworth, 1983, links defence and the economic theory of Public goods. He also gives an interesting treatment of weapons procurement in Britain, France, West Germany and the Soviet Union, (pp.117-128), and a case study of the procurement of the Polaris Submerged Launched Ballistic Missile, (pp.129-137).

2 Young, Judith H., The French Strategic Missile Programme, Adelphi Paper No. 38 Institute for Strategic Studies, July 1967.

3 L'Espace: un Défi pour la France, Actes du Colloque, 28-29 novembre 1985, Association des anciens élèves de l'ENA, 1986.

4 *'Au plan stratégique et militaire, les options françaises s'identifient aux moyens nécessaires à l'exercice des missions prioritaires de notre défense: la permanence de notre dissuasion nucléaire et notre capacité de maîtriser les crises'.* Leloup, J-Y., and Cazalas, P., 'Les Options spatiales françaises, Défense Nationale, (February 1986), pp.133-140.

5 F. Mitterrand, Le Monde 9 February 1984, p.3.

6 Paolini, J., Politique spatiale militaire française et coopération européenne, Politique Etrangère, (2/87), pp.435-450.

7 Ailleret, General C., Défense dirigée ou défense tous azimuts ?, Revue de Défense nationale, (December 1967), pp.1923-1932.

8 E.g.,Vilars, J., Vers le désarmement français ?, Libération 20 October 1988.

9 See for example Heisbourg, François, Défense française: l'impossible statu quo, Politique internationale, No. 36, 1987.

10 Leloup, J.-Y., Table ronde :Quelles réponses techniques ?, in L'Espace : un Défi pour la France', pp.125-152.

11 Note the French Olympus satellite broadcasting programme.

12 He was *'parfaitement convaincu de l'importance extraordinaire que va revêtir, que revêt déjà, que revêtira de plus en plus le domaine spatial sous un angle militaire ou stratégique'.* L'Espace: un Défi pour la France, p.99.

13 F. Mitterrand, *Ile Longue* 25 May 1985, (Service de Presse de la Présidence de la République).

14 L'Espace: un Défi pour la France, p.99.

15 The enlarged anti-cities principle includes an 'anti-oeuvres vives' element, see Yost, David S., Frances' deterrent posture and security in Europe, Adelphi Paper No. 194 (IISS, 1984), pp.15-16.

16 *il nous faudra consentir un effort considérable au niveau des armes offensives françaises, ce qui implique des armes balistiques, mais aussi des armes non-balistiques'.* L'Espace: un Défi pour la France, pp.107-108.

17 *La France ne souhaite pas une course aux armements anti-missiles. Si une telle spirale devait être provoqueé par les superpuissances, nous disposerions des moyens techniques nécessaires pour préserver la crédibilité de notre propre force de dissuasion grâce aux progrès quantitatifs et qualitatifs de nos systèmes d'armes prévus ou envisagés.* (Senate, 27 April 1984), Hernu, Charles Défendre la Paix, Jean-Claude Lattès, 1985, p.254. Also : *La France suit avec grande attention les mutations que provoqueraient le déploiement dans l'espace de nouvelles armes. La France se bat pour la paix dans l'espace, c'est la signification qu'il convient de donner aux propositions qu'elle a soumises à ses partenaires et qui font d'ores et déjà l'objet d'échanges, de concertations avec ses alliés.* (Villeurbanne 23 June 1984), .Défendre la Paix, p.258.

18 For a critical viewpoint on this argument, see Vilars, J., 'Vers le désarmement français ?', Libération 20 October 1988.

19 Thierry de Montbrial, Director of IFRI, interviewed in Le Monde 18 July 1989.

20 Le Monde 23 May 1989.

21 Le Monde 16 June 1989.

22 Howorth, J. M., Resources and strategic choices : French Defence policy at the crossroads, The World Today (May 1986), pp.77-80.

23 President Mitterrand, *Conférence de presse* 18 May 1989; *'Le rôle de la France est de tenir son rang'*, Le Monde 20 May 1989.

24 *'L'Espace pacifique'* is a chapter heading in Charles Hernu's Défendre la Paix, p.253.

25 United Nations special session on disarmament (UNSSOD), International satellite monitoring agenct (ISMA) proposition.

26 Curien, Hubert, La France dans l'Espace, Défense Nationale (May 1981), pp.25-33. p.31.

27 Intervention de Claude Cheysson before the Second Extraordinary Session of the General Assembly devoted to Disarmament, (French permanent Mission to the UN, 1982), p.17.

28 Reported in Le Monde 8 January 1985 and 10 January 1985. Reproduced in *'BMD ; un point de vue français; extrait de l'intervention française à la conférence du désarmement, Genève, 12 juin 1984'*, Politique Etrangère, (1984, 2/49), pp.377-380.

29 *'les utilisations militaires de l'espace apparaissent comme mineures par rapport aux utilisations civiles. Le maintien à terme de la crédibilité de l'espace français passe, sans doute, par son utilisation militaire, gage de la fiabilité des équipements et de l'indépendence en matières de composants. Cette maîtrise de la technologie pourrait constituer l'un des arguments de la dissuasion et également la possibilité pour la France d'actions nouvelles au niveau politique, notamment pour le contrôle du désarmement.'* Pichoud, Daniel, Défense et Espace, Défense nationale (January 1984), pp.127-140.

30 The detail and significance of the military establishment's structural organisation of space matters will be discussed in Chapter 9.

31 Assembly of Western European Union, 34th Ordinary Session, (second part); Verification : a future European satellite agency, Report submitted by M. Fourré, *Rapporteur*, on behalf of the Committee on defence questions and armaments, Document No. 1159, 3 November 1988.

32 Alain Simon, *Conseiller pour les Affaires militaires au CNES*, interview, 9 February 1989.

33 Leloup, J.-Y., and Cazalas, P., Les Options spatiales françaises, Défense Nationale, (February 1986), pp.133-140.

34 These uses have also ben described as 'para-military', for example by Michel Duclos of the CAP/*Ministère des Relations extérieures*. See his speech Continuité ou remise en cause par les deux plus grandes puissances in L'Espace: un Défi pour la France, pp.89-92.

35 Les Options spatiales françaises, Défense Nationale, (February 1986), p135.

36 *'Aussi loin dans le temps que porte l'analyse, il apparaît ainsi que l'espace ne peut remettre en cause la dissuasion nucléaire'. 'Les Options spatiales françaises'*, Défense Nationale, (February 1986), p.137.

37 *Pour la France, loin de constituer une alternative à la dissuasion nucléaire* (a false problem) *l'espace pourra à l'avenir se présenter comme un complément de plus en plus efficace de celle-ci au même titre que l'ensemble de ses forces conventionnelles'*. Leloup and Cazalas, Les Options spatiales françaises, Défense Nationale, (February 1986), p.140.

38 IGA Bousquet, Les perspectives d'utilisation militaire de l'Espace, paper given at the *Cours supérieur interarmées*, 22 January 1988, (*Ministère de la Défense/DGA-DEN*, 26 January 1988).

39 Vice-Amiral d'escadre Alain Coatanéa, L'Espace militaire, pourquoi ?, paper presented at the *Activités spatiales militaires* conference, (25-27 October 1988, Paris), reprinted in L'Aéronautique et l'Astronautique, (1989-3-4, Nos.136/137), pp.45-47.

40 An interesting concept, implying that the military influence of France in the world can be increased through the multiplier effect of para-military information gathering in a new context where war is unlikely. This notion parallels that of 'international judo' played by France in terms of diplomacy and international relations in order to maintain her rank in the world.

41 Heisbourg, François, (Director IISS, formerly with Thomson SA and during 1981-85 advisor to the French Defence Minister Charles Hernu), in L'Espace: un Défi pour la France, pp.102-103.

42 *'Nous sommes en train de vivre des discontinuités technologiques ou de nature stratégique, comme on l'a vécu dans les années 50, puis dans les années 70. Nous avons su utiliser ces discontinuités à d'autres moments: nous avons compris que l'atome avait un pouvoir égalisateur, je crois qu'il est temps que nous comprenions que l'espace aussi peut avoir un aspect égalisateur et un pouvoir de ce genre'*. Battistella, Jacques, (Matra), in L'Espace: un Défi pour la France, pp.104-106.

43 Battistella, Jacques, (Matra), in L'Espace: un Défi pour la France, pp.105.

44 Touraine, Marisol, (SGDN), La France face aux armes antisatellites, Défense Nationale (March 1987), pp.61-73.

45 Interview, April 13 1989.

46 Touraine, Marisol, (SGDN), La France face aux armes antisatellites, Défense Nationale (March 1987), p73.

47 Heisbourg, François, Premières leçons militaires pour la France, Libération, 19 February 1991.

48 The full formulation of Mitterrand's remarks was as follows: *'Les leçons de notre expérience militaire : cela veut dire que, tout en constatant la qualité de nos matériels, nous devrons les moderniser, comme cela est prévu, les adapter constamment à l'évolution des techniques. Faut-il pour autant changer de stratégie ? Non. La force de dissuasion nucléaire est et en restera le pivot. Quant à la force d'action rapide et à la marine de haute mer, la guerre du Golfe en a démontré la remarquable utilité. S'il s'agit de protéger le territoire national et de contribuer à la défense de l'Europe, la participation de tous les citoyens, ce qu'on appelle la conscription, me paraît nécessaire. S'il s'agit d'opérations lointaines, nos soldats professionnels en ont la compétence et la mobilité. Un débat sur l'équilibre interne de nos armées, sur leur composition, sur leur nature s'impose.'*, Le Monde, 5 March 1991.

49 Other views were expressed by Georges Marchais for the Communist party, Jean-Michel Boucheron (President of the parliamentary Commission de la défense et des forces armées), Antoine Waechter for the Green party, Jean-Pierre Chevènement for the Ceres tendency within the Socialist party, the Armed forces chiefs of staff, Philippe Séguin of the *Rassemblement pour la République*, and Edith Cresson.

50 *'Compte tenu de ses dimensions et de ses ressources, il [notre pays] ne peut se présenter ni come un "samouraï" ni comme un "marchand". Mais il a son génie propre et de nombreux atouts parmi lesquels ses capacités technologiques. Encore faudrait-il que ces atouts, il ne les sacrifie pas sur l'autel de ses complexes'*, Martre, H., Les samouraïs et les marchands: La France ne peut laisser à d'autres le soin d'assurer et de financer sa sécurité, Le Monde, 28 March 1991.

51 In fact, Martre enumerated four principles which he felt should inform the great debate on security: that military planning has to cater for developments twenty and thirty years distant; that France's low birth-rate and high technology mean she must privilege science in her defence; thirdly that defence has to be cost efficient, and fourthly; that the international context of French defence should be assessed realistically.

52 See Le Monde 12 July 1991, 22 July 1991, 19 September 1991, 3 October 1991, 14 October 1991, 19 December 1991.

53 Speaking on television in March 1992, President Mitterrand mentioned the possible need for France to 'diversify priorities' in strategic thinking - in other words to reconsider the primacy of the nuclear deterrent in strategy and armed forces' funding. See Le discours du Président de la République, Le Monde 14 April 1992, pp.14-15.

54 M. Joxe veut donner au renseignement militaire le statut d'une arme, Le Monde, 8 May 1991.

55 Quoted in Guisnel, Jean, L'armée soigne sa myopie au satellite, Libération, 7 May 1991.

56 *'les mêmes raisons qui ont conduit la France à se doter d'un outil autonome de dissuasion nucléaire doivent nous conduire à développer une capacité autonome d'observation spatiale'*, reported in Guisnel, L'armée soigne sa myopie au satellite,Libération, 7 May 1991.

57 See Colonel Petkovsek, L'utilisation militaire des engins spatiaux, Revue militaire générale, July 1961.

58 Guisnel, Jean, L'armé soigne sa myopie au satellite, Libération, 7 May 1991.

59 The full quotation is :*Si la France des années 2000 veut conserver sa place dans une mouvance internationale de plus en plus dangereuse, certains efforts sont nécessaires. Notre défense ne peut que décliner sans. . . investissement dans le spatial. Une force de frappe sans renseignement national est gelée au sol; elle sera de facto dépendante du système nord-américain de guerre assistée par ordinateur. Un plan de rattrappage est impératif, comme le fut en son temps le plan atomique, ne serait-ce que pour le renforcer'.* Delmaire, Gérard, Un système de défense spatiale pour les années 2000, Défense Nationale, February 1992, pp.49-56.

9. Organisation, Planning and Funding of military space activities

French military space institutions and structures as they stand today date essentially only from 1985. Before the major effort made by the Ministry of Defence under Charles Hernu at that time to update existing structures and to create new institutions and thinking, neither the *Etat Major des Armées* (EMA)nor the Ministry of Defence itself had any specific bodies dealing solely with space. This is not to say of course that the possibilities of military use of space were not considered before 1985, or that French military planners were caught totally by surprise by President Reagan's 1983 launch of the SDI and its attendant structures. Prior to 1985 in effect, space-related matters within the Ministry of Defence were dealt with by the authorities responsible for the *Force de Dissuasion.* The quickening of interest in military space in the 1980s, both before and after SDI, culminated initially in Hernu's reform of structures. Thus one of the major instruments of French military space policy, the *Plan Pluriannuel Spatial Militaire* (PPSM) predates the creation of the organisms we shall analyse below.[1]

In terms of the sociology and politics of the armed forces, the current context of French military space activities can perhaps be simply described in two opposing ways. Firstly there is the official explanation of the mechanisms of strategic need, research, development and production put forward by the Ministry of Defence/EMA/DGA; and secondly, in opposition to this, the 'suspecting glance' typified by the independently minded and highly respected critic of military extravagance Admiral Antoine Sanguinetti, who asserts that no-one is at all concerned with the real defence of France and that the whole procurement system is motivated by *'fric et fantasmes'*.[2] In looking at the defence establishment planning and decision-making processes in missile and satellite development we take them to be similar to those obtaining in the atomic programmes, an assumption supported by Mendl's assertion that 'The pattern of civil-military collaboration which dominated the military programme of the CEA in its period of clandestinity was repeated in the more open missile and space research programmes'.[3] The analyses of Mendl and of Kohl underlined the complex causation of high-tech weapons procurement. Their contributions concern what might be termed the 'sociology' of decision making in military space technology acquisition: Kohl remarks that the military nuclear programme was not led from the highest authorities (the Prime minister and his cabinet), but by 'second-rank officials' (technocrats and military officers in the CEA).[4] Similarly, Mendl states that in the early years at least, discussion of the choice of delivery systems, limited

at that time to long-range bombers and unperfected ground to ground missiles was restricted to a small group of technical officials and a few politicians.[5]

Such considerations on the status of decision-makers in the choice of weapons and delivery systems reflect another distinction drawn by Sapolsky, namely that between possible 'macro-sociological' and 'micro-bureaucratic' approaches to weapons acquisition studies. Taking the case of the *Force de Frappe*, a potential 'macro-sociological' explanation would invoke the fact that its development simultaneously provided the French army and France herself with an expensive and prestigious 'toy' as compensation for declining professional and national self-esteem caused by the reductions in personnel of the Army after the Algerian War and the social malaise engendered by the instability of the Fourth Republic. A micro-bureaucratic approach would highlight the roles of individual actors in the decision making processes, typically, for Sapolsky, 'bureaucratic entrepreneurs...from the ranks of weapons designers or the officer corps'.[6] A 'micro-bureaucratic' style of enquiry is best applied to our investigation of the relationships between the *Etat Major des Armées* and the *Délégation Générale pour l'armement*, and between these military structures and political authority.

Before looking at the structures themselves however, it is necessary to present the institutional context within which they operate. The main institutional context is of course the Ministry of Defence. This background is characterised by a division of responsibilities and influence between the bodies charged with the purely military aspects of space and those dealing with the technical and industrial questions which arise in the process of satisfying the demands of space applications.

The plan of the chapter is thus as follows :

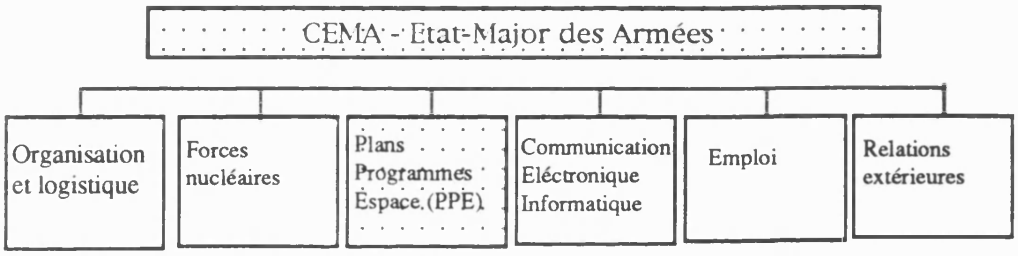
- **9.1.** *Etat-Major des Armées* and *Délégation Générale pour l'Armement*
- **9.2.** New interest in military space in the mid-1980s - new space bodies within the Defence ministry
- **9.3.** Post-Gulf War innovations in the organisation of military space
- **9.4.** Organisational efficiency and internal synergy
- **9.5.** Funding for military space - past, present and future
- **9.6.** Conclusion

In order to give a consideration of the Defence Ministry and space we turn now to a discussion of the main organisational structures of the Defence Ministry and their relations to space activities.

9.1. The *Etat Major des Armées* and *Délégation Générale pour l'armement.*

These two sectors of activity within the Ministry of Defence are represented by the *Etat Major des Armées* (EMA) and the *état-majors* of the three armed services for the strictly military aspects, and by the *Délégation Générale pour l'Armement* for the technical and industrial aspects. The *Etat Major des Armées* consists of six separate divisions staffed by career military personnel.[7] The six divisions cover the totality of the operational requirements of the armed forces, ranging from Organisation and logistics, Communication-electronics-computing through External relations and Employment to Nuclear forces and *Plans-Programmes-Espace* which alone now has responsibility for the operational aspects of space systems.

The Plans-Programmes-Espace Division and the EMA

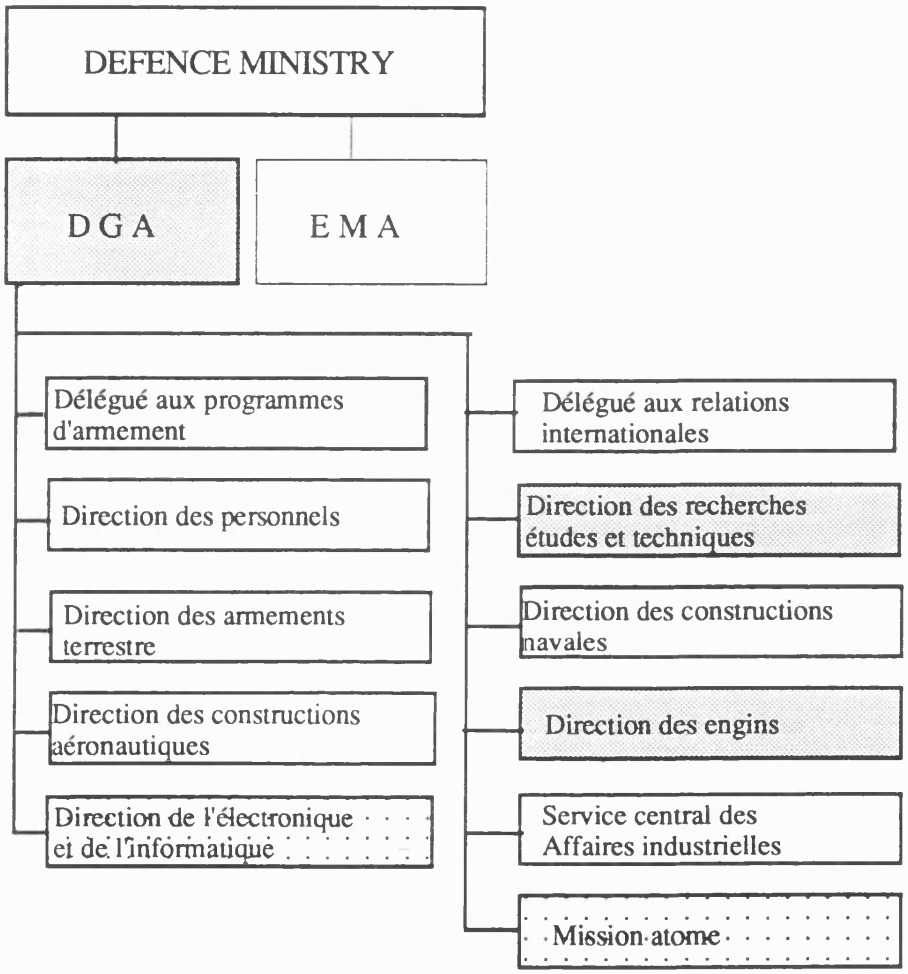


Each division is headed by an *officier général* of the EMA who has the task of assisting the *Chef d'Etat Major des Armées* (CEMA). Since the CEMA is second in rank only to the Defence Minister, (and the President of the Republic), whom he advises on the use and organisation of the armed forces at the same time as supervising the management of defence-related research and information gathering, the work of the specialised divisions has an almost exceptionally close direct link with the final centres of decision making.

The *Délégation Générale pour l'Armement* (DGA) is the technical and industrial counterpart of the EMA.[8] It is headed by the *Délégué général pour l'armement,* during January 1989 - May 1993 M. Yves Sillard, (formerly of CNES and, immediately prior to his replacement of Jacques Chevallier at the DGA, General secretary of the French EUREKA secretariat).[9] Created in 1977 in a renaming of the *Délégation Ministérielle pour l'Armement* (DMA), instituted in 1961 at the same time as CNES, the DGA brings together all the producers of arms used by the French armed forces as well as those sold as arms exports. Backed by a number of departments dealing with administrative and financial issues and by six technical directorates, the *Délégué Général* manages the running of arms study,

research and production programmes. The following diagram gives a simplified representation of the organisational structure of the DGA :

The *Délégation générale pour l'Armement*



(Shading represents involvement in military space)

Of the *directions techniques*, during the 1980s the *Direction des Engins* (DEN - responsible for ballistic missiles) and the *Direction de l'Eléctronique et de l'Informatique* (DEI) were the most heavily involved in space programmes along with to a lesser extent the *Direction des Recherches, Etudes et Techniques* (DRET).[10] In 1991, however, under the catalysing effect of the lessons drawn from the Gulf War, the DEN was reorganised into a *Direction des Missiles et de l'Espace* (DME), both as a modernisation and clarification of terminology and as a structural measure intended to simplify interaction between the DGA and the space industry.[11]

The theoretical relationship between the EMA and the DGA is that of equal client and supplier. EMA officers identify a "*besoin militaire*", or military

requirement, and ask the military engineers of the DGA's relevant services to study, research and propose technical solutions fulfilling the operational requirements set out by the EMA. When a satisfactory solution is proposed, the EMA makes an appeal for tenders from industry through the DGA. If a tender is accepted, the DGA manages the running of the programme in its technical and industrial aspects, with the EMA checking the ongoing work to ensure that there is no divergence from the operational characteristics requested. The different natures of the officer corps of the EMA and the DGA leads to a potential conflict of ambitions between these two wings of the Defence Ministry In effect, there is a tendency within the DGA to carry out work independently of any request formulated by the EMA, a recent example of this being research on Extra High Frequency radio communications.[12] Moreover, since it is the DGA which has final control over the funding of Defence Ministry work with industry, it is sometimes inclined to 'anticipate' operational requirements in its research into potential arms systems. Indeed, one of the modifications brought in 1985 to the mechanisms dealing with space in the Defence Ministry was a measure specifically designed to reduce the possibility of friction between the two institutions. Unfortunately however, at the same time, a transfer of responsibility for space from one division to another within the EMA created internal tensions to replace those previously experienced by the EMA vis-à-vis the DGA.

Within this organisational context, we now turn to a consideration of the bodies that deal with the space sector and how these bodies influence space policy.

9.2. Mid-1980s interest in military space- new space-related bodies

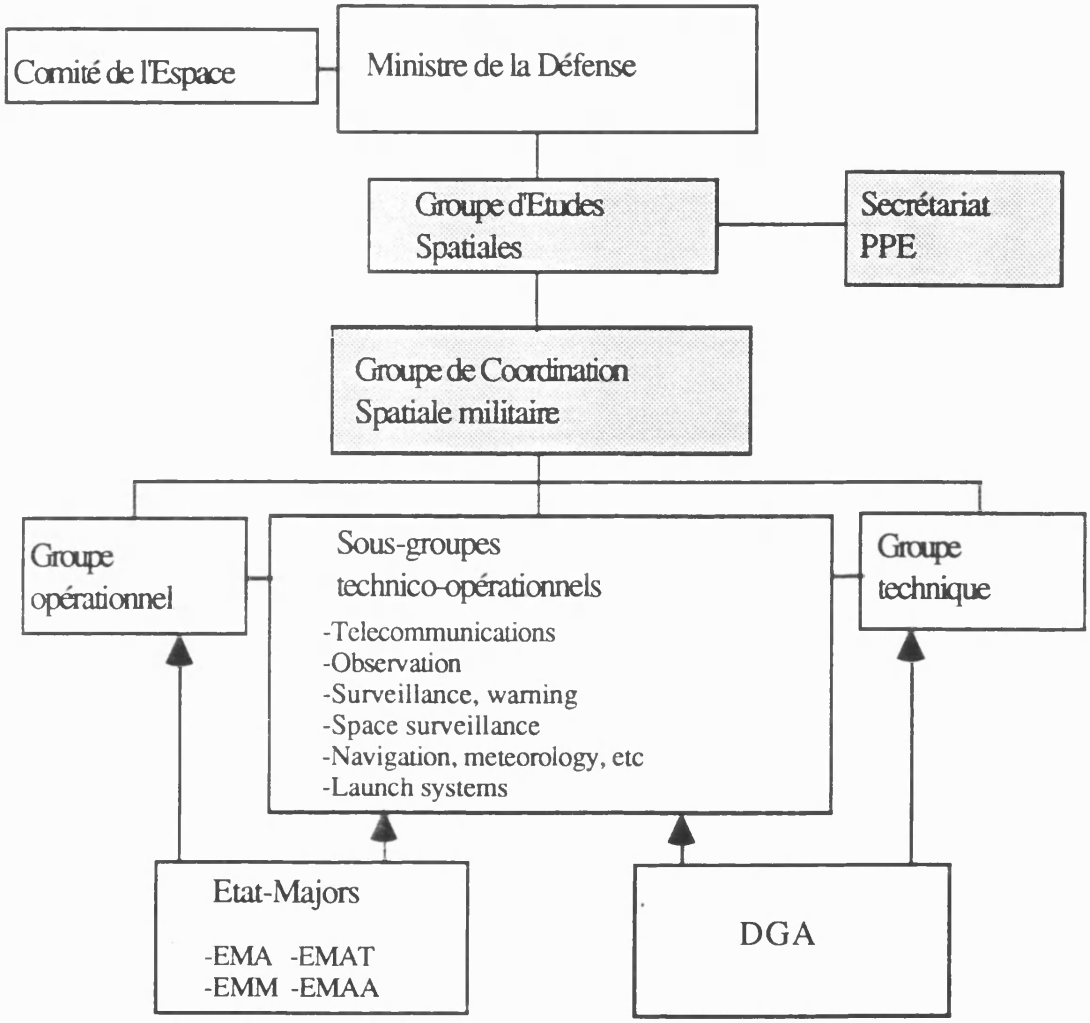
The institutional changes and innovations of 1985 appeared as the practical, organisational effects of a period of increasing awareness of, and interest in the military applications of space for France. The advent of the Socialist administration had brought a President who had a strong personal interest in the symbol of the FNS and in space, the SAMRO project (*SAtellite Militaire de Reconnaissance Optique*) had passed through a period of intense debate in 1982-83 before finally passing away, and 1983 itself had seen President Reagan's 'Star Wars' proposal.[13] In 1984 at The Hague, President Mitterrand suggested that Europe should cooperate on a manned space station and observation and communication satellites.[14] Furthermore, the failure of bilateral discussions between the French and West German Defence Ministries over *Hélios* (the

successor to the SAMRO project) underlined simultaneously awareness of the importance of military space, the difficulties of collaboration and the seeming necessity for France to lead from the front in this field as well as in the civilian sector.

According to General Bertrand de la Presle, former head of the *division Plans-Programmes-Espace* at the EMA, prior to 1985 "*l'espace militaire était traité par les états-majors d'armée dans le cadre de leurs responabilités de programmation.*"[15]. This is a somewhat opaque way of saying that space was essentially dependent on the bodies responsible for the *Force de Dissuasion*. Immediately prior to the creation of the *Groupe d'Etudes Spatiales* (GES) in March 1985, military space matters were dealt with by the *Groupe nucléaire militaire de l'espace*. In the late 1970s, responsibility for space had lain with the *Groupe des Forces nucléaires*, who proposed studies on the SAMRO project in 1977. This link between the nuclear force and space is of course both natural and historical: in the early years of the Fifth Republic ministerial authority for the two was conflated in the *Secrétariat d'Etat aux questions atomiques et spatiales* under Pierre Guillaumat[16] The closeness and inevitability of the link between the nuclear force and space does not however mean that relations are always harmonious between the two; the proceedings of the *Groupe nucléaire militaire de l'espace* were hindered by tensions between the EMA and the DGA. These tensions were caused principally by the fact that the Group was chaired jointly by the *Sous-Chef Plan* for the EMA and by the *Délégué Général* for the DGA. The superior rank of the *Délégué Général* put the EMA in a subordinate role in discussions, in contradiction with the theoretical client-supplier relationship existing between the EMA and the DGA. This tension, and the desire to have structures having clear responsibility solely for space was a contributory factor leading to the creation of the GES, (the so-called *"Etat Major de l'Espace"*) in March 1985.[17] The separation of authority over space from that over nuclear issues caused some resentment in the nuclear corps, but the innovation of making a high-ranking EMA officer chairman of the new group, assisted by a DGA engineer gave a smoother hierarchy of influence more in conformity with the 'precedence' of the EMA.[18]

The diagram overleaf gives a simplified schematic representation of the organisation of French military space as it was structured in 1985.

The Organisation of Military space activities 1985 -



(Modified from DGA documentation)

9.2.1. The *Groupe d'Etudes Spatiales* (GES) : high-level authority for space

The original 'tandem' of officers in charge of the GES was composed of the *Général de division aérienne* Guy Fleury, *Sous-Chef* of the EMA's Organisation and logistics division, and by *Ingénieur de l'armement* (IGA) Jean Sandeau, *Directeur des Engins* at the DGA/DEN. At the end of August however, Fleury was replaced as President of the GES by *Vice-amiral d'Escadre* Bernard Louzeau, previously commander of the *Force Océanique stratégique* (FOST). Again assisted by Sandeau of the DEN, Louzeau was simultaneously *Major-Général* of the EMA, reporting directly to the similarly newly-appointed *Chef d'Etat Major des Armées* (CEMA), General Jean Saulnier, previously (1981-85) President Mitterrand's *chef d'état major particulier*, or personal chief of staff - a position of significant influence over policy formulation. With this appointment the rank

accompanying the Presidency of the GES illustrated vividly the importance accorded to space issues within the Ministry of Defence. In effect, the GES is only at one remove (the CEMA) from the Minister himself.[19] In 1986 Louzeau was succeeded by Admiral Alain Coatanéa, working with IGA Daniel Pichoud of the DEN. The to-ing and fro-ing of these officers between the GES and the Elysée, indicative of Mitterrand's attention to space matters, was continued in 1989 with Coatanéa's departure to advise the President.

9.2.2. The GCSM, the division PPE and PPSM.

The *Groupe d'Etudes Spatiales* was not the only organism created in the 1985 reorganisations. An attempt to secure the harmonious cooperation of EMA officers and technical experts from the DGA was represented by the inauguration of the *Groupe de Coordination Spatiale Militaire* (GCSM), chaired jointly by representatives of the EMA/*Division Plans-Programmes-Espace* and of the DGA. The division *Plans-Programmes-Espace* (PPE) functions to a certain extent as the secretariat of the GES, although the PPE is itself headed by a high-level officer (General de la Presle, succeeded by General Christian Fontaine). The GCSM is in charge of seven *groupes technico-opérationnels* responsible for technical and practical aspects of various military technologies.[20] The studies and propositions of these working groups, coordinated by the GCSM, inform the reflections and decisions of the GES. The *Plan Pluriannuel Spatial Militaire* (PPSM) is thus in part dependent on the activities of these organisms.

The PPSM is drawn up under the chairmanship of the *Directeur des Engins* (or *Directeur des Missiles et de l'Espace* post-1991) in the GES, and is signed jointly by the *Délégué Général pour l'Armement* and the *Chef d'Etat Major des Armées* before being presented to the Minister for final approval. Before its presentation for integration in the Defence budget the PPSM has already the support of the highest échelons of the military establishment below the Minister himself, as well as potential input directly from the presidency via Saulnier as CEMA. Despite its considerable importance, the PPSM is not the only fruit of the GES's activities: the Minister also receives an annual report on the military space sector in France and a presentation of GES projects and the state of development of its programmes. Although it was initially devised in 1983, the PPSM in its current form is a product of Hernu's new structures, it represents the final synthesis of the functions of the GES, the PPE, the GCSM and the technico-operational working groups. Before considering in more detail the functioning of these structures we will now present in outline the aims of the PPSM, its exact content of course being 'top secret'.[21]

The PPSM has a fifteen- to twenty-year rolling horizon and is brought up to date ('*actualisé*') every two or three years. The 1983 - 1988 PPSM was reviewed in 1985, the updated PPSM 1987 - 2002 was modified in 1989, and the third Plan for 1992 - 2002 was redefined in 1991-92. The present PPSM contains scenarios for the development of the French military space sector over the period 1992-2002.[22] These *"grandes orientations"* aim to define the space requirements of French defence policy, to assess the threats posed to France by potential enemy use of space, and to propose the means and resources that France should devote to military space activities. In this way the PPSM represents the technical and industrial solutions proposed by the DGA to the military requirements expressed by the EMA.

These space-related bodies in the military establishment essentially originated during the mid-1980s, under the stimulus of French reactions to the perceived threats of SDI. In 1990-91, the Gulf War provided another impetus for French action in military space.

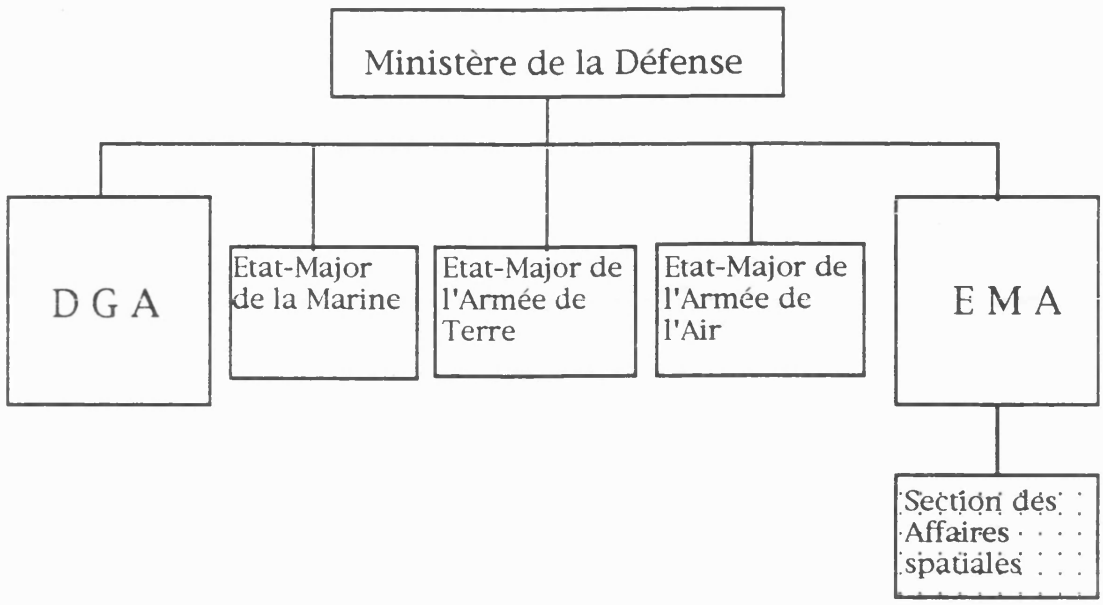
9.3. Post-Gulf War innovations in the organisation of military space

After the Gulf War, military interest in space hardware was considerably intensified by the strategic lessons drawn from 'the first space war', as we have seen in the preceding chapter on the evolution of strategy and military space requirements. This renewed enthusiasm also led to even closer scrutiny of the organisational mechanisms of the definition of military space policy and the management of military space programmes. Innovations were instituted in the organisation of military space structures which were intended to ensure greater efficiency and effectiveness in military space policy making. The major changes concerned a new space body within the EMA, a new space post within the EMA, a redefinition of the nature and importance of intelligence gathering and a new organisational bridge between military and civil space.

9.3.1. The *Section des Affaires spatiales* (EMA)and *'le général Espace'*

The *Section des affaires spatiales* is a department of the *Etat-Major des Armées* created to reflect organisationally the increased importance of military space. The diagram overleaf represents the relationship between the EMA and the Defence ministry:

The *Section des affaires spatiales* and the EMA



The composition of the *Section des affaires spatiales* reflects the various aspects of military space activities, from officers responsible for following research projects, funding developments and possible cooperative ventures, through the *'officier programme'* in charge of Hélios and colleagues leading other current projects, to the vice-president of the GCSM.

In addition to the *section des affaires spatiales*, the EMA also plays host to the so-called 'général Espace', who undertakes to liaise with those generals in the Army, Navy and Air Force who have responsibility for military space in the context of their particular service. The creation of such a post within the EMA is indicative of the Defence Ministry's desire to increase the coordination of military space thinking and policy making, in order to protect military space from attack by 'regulatory' government bodies keen to cut costs and programmes.

9.3.2. The *Direction du Renseignement militaire* (DRM)

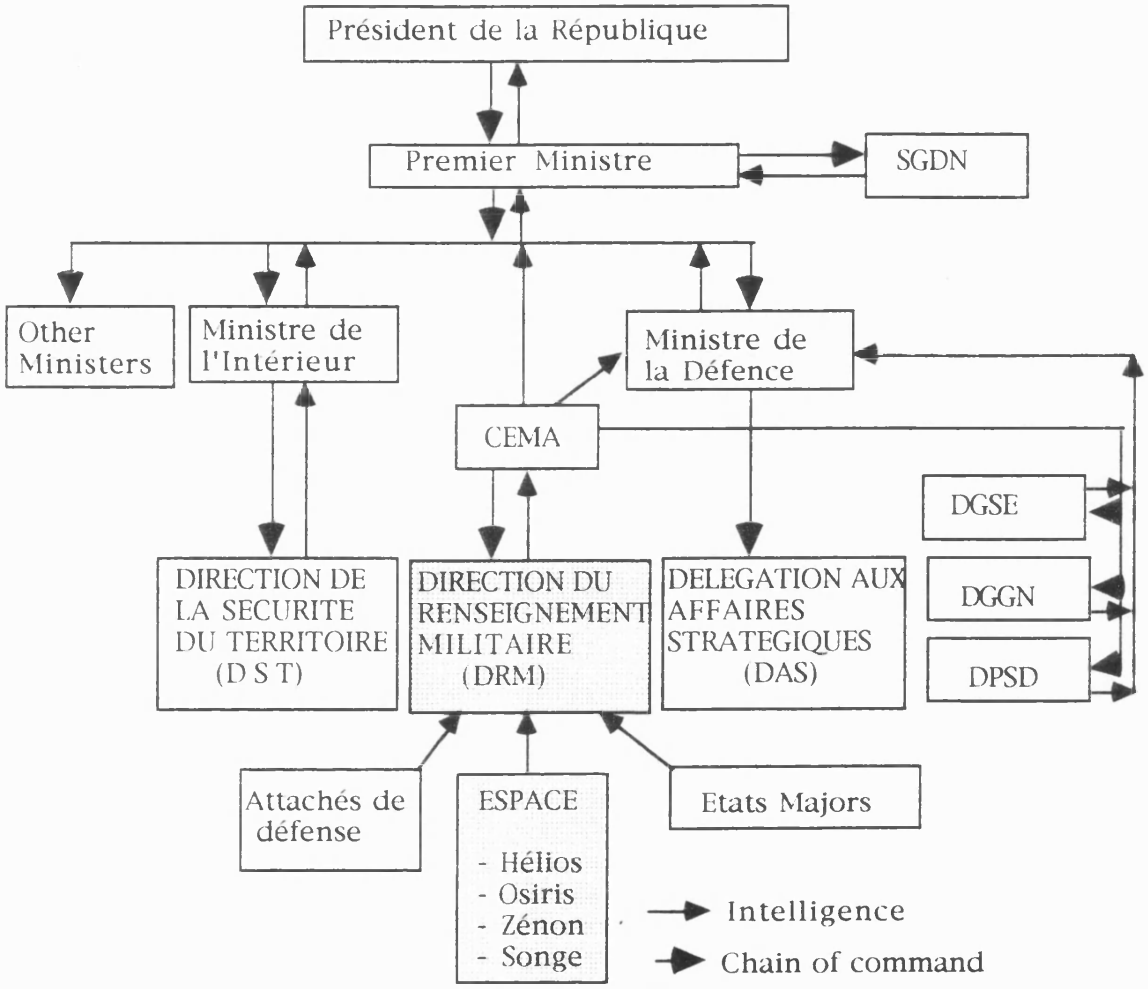
The intention to rationalise the organisation of France's intelligence gathering services was announced by Defence Minister Pierre Joxe in May 1991. The need for such rationalisation had been demonstrated by French difficulties during the Gulf War, which were deemed to be caused by both deficiencies in technical capabilities (observation, communications) and by organisational inefficiencies. Joxe especially stressed the fact that the French intelligence service of the future

would have to combine *'équipements adaptés - satellites d'observation - et personnels reconnus'*.[23]

In July 1992 the *Direction du Renseignement militaire* was set up with a personnel of some 450 in order to provide a measure of centralisation for the previously disparate intelligence bodies. The DRM brought together a variety of existing structures, in particular the principal command centre for the Hélios military observation satellite (CPHF), the Combined Forces Image interpretation Centre (CF3I), and the *Centre d'exploitation du renseignement militaire* (CERM). In the early stages of thinking about the composition of the DRM, the question of the appropriate home for the reception and treatment of data from Hélios did not find a definite answer, but in July 1992 the decision to place the CPHF at the centre of the DRM reflected a realisation of the major importance of the specifically *spatial* elements of intelligence gathering.[24]

The diagram overleaf illustrates the general organisation of French military intelligence subsequent to Joxe's modifications, and shows the central importance of space-derived contributions to the DRM in particular and to the political authorities in general. The DRM reports directly to the *Chef d'Etat-major des Armées* (CEMA - Chief of staff), who in turn is directly responsible to the Defence minister and to the Prime minister. The diagram also reveals the number of, (and complex interactions between), the different intelligence structures. Although the DRM was clearly set up as a clarification of the organisation of intelligence gathering, apart from the streamlining of spatial intelligence gathering, doubts remained over the relationships evolving between the other bodies such as the DGSE, the SGDN and the DAS.[25]

Place of space systems and the DRM in French Military intelligence



(Adapted from Loi de Programmation militaire 1992-97, p.379)

One further improvement to the organisation of military (and ultimately civil) space activities was what is known as the *Comité Delta*.

9.3.3. The *Comité Delta* - military-civil coordination

The *Comité Delta* was set up by CNES and the *Délégation générale pour l'armement* at the suggestion of Defence Minister Pierre Joxe in August 1991. It is a high-level consultative body which brings together representatives of the DGA, the EMA and CNES to discuss the harmonisation of civil and military projects. The Committee represents a further attempt to coordinate and streamline both the making and implementation of policy in all the fields where civil and military interests can coincide. Thus during 1991-92 the Committee negotiated collaboration between CNES and the DGA on applications programmes to

continue the Spot and Hélios observation satellite projects and also considered ways of better coordinating research and development activities.

The motivations behind the creation of the *Comité Delta* were two-fold. Firstly, the Gulf War had focussed attention on the need for the military-industrial complex to provide France with the technical means to redress the manifest deficiencies of her military telecommunications and surveillance facilities, and thus more even than before, the DGA and EMA were concerned to guarantee the efficiency of procurement. This was doubtless the major motivation for Pierre Joxe as Defence Minister, convinced of France's obligation to modernise her armed forces through space Secondly, the prevailing context of economic recession and budgetary rigour meant that, in the field of science and technology, the government was increasingly emphasizing the need for military and civil research and development to attain a high level of coordination.[26] In the field of space technology, where military activities accounted for spending of over 3 billion francs per annum in 1991 and 1992, the necessity of coordination and the opportunities for it were evident.[27]

The creation of the Delta Committee represented an addition to the panoply of bodies already set up to ensure the efficient running of the military space programmes. Although it did not represent a change of direction for CNES-DGA relations, the Committee's particular nature as a body attempting to establish new and overt institutional bridges between civil and military space was perhaps indicative of a growing desire on the part of government to simplify the patterns of interaction within the overall space sector. Patterns of interaction between bodies within the military space system itself tend to reflect a tendency towards the search for efficiency and synergy.

9.4. Organisational efficiency and internal synergy in military space

The functioning of the space-related structures analysed above exemplifies ways in which the military space sector attempts to protect itself against outside pressures.

The DGA is periodically the object of American admiration for its successes in arms production and sales, and for the efficiency with which it coordinates state, military and industrial efforts in favour of French influence in the world. According to Lieutenant-Colonel Bouchard of the PPE, the organisation of French military space has similarly been the cause of envy in the United States because of its relatively simple, streamlined nature.[28] Indeed, perhaps the major problem

encountered by the US space industry is the confusion created by its size and complexity: firms wishing to collaborate with the armed forces on space systems may have diffficulty in identifying the appropriate correspondent within the Defence Department [29] In contrast, the relatively small scale of the French space sector, both military and civilian, gives the Americans the impression of efficiency and organisation. Mere size is not however the only explanation for this efficiency. US enthusiasm is justified to the extent that the whole organic structure of the space related institutions of the French Defence Ministry is designed to foster easy cooperation between the many different partners involved in the space sector and thus to create the conditions for efficiency. It would appear that US authorities are trying to integrate some features of the French *organigramme* into their own systems. The effect of efficiency is not restricted to the internal workings of the space instances; it also helps to promote the image of space within the Defence Ministry. Some of the characteristics of military space matters which favour their importance within the Defence Establishment have already been mentioned, such as the high level at which space projects are discussed and finalised, and the privileged access to the Defence Minister enjoyed by the GES. We shall now consider in more detail the other attributes of French military space institutions which contribute to the success of their activities.

9.4.1. Reconciling technical and strategic ambitions

The most visible proof of the will to create synergy within the structures themselves is the *Groupe de Coordination Spatiale Militaire* (GCSM), whose joint composition (co-presidence EMA-PPE/DGA) and the role of managing the equally hybrid technico-operational working groups exemplify the need to harmonise the relationships between the two poles of authority within the military space establishment. In more detail, the role of the GCSM is to receive the reports on the activities of the sub-groups which meet at least twice every twelve months to consider the development of existing technologies in their specialised domains, or to envisage advance studies of emerging technologies, (*'études amont'*). As well as acting as clearing house for these contributions to the initial elaboration of the PPSM, the GCSM also interacts with the work of the sub-groups, rejecting some suggestions on the grounds of expense and requiring less costly solutions to the operational needs expressed to be found, or laying down new operational criteria for the technical solutions. In this way, the GCSM translates the presence and views of the *Direction des services financiers* (the finance and accounts division of the Defence Ministry) in the GES committee.[30]

Synergy is also assured by the *'interarmées'* composition of the PPE which assists the GES. This joint composition reflects as faithfully as possible the nature of operational responsibilities for space systems in all branches of the armed forces. The frequency of the work of the PPE is such that the secretariat reports twice weekly to the head of the division PPE. This contact between the work of the officers supporting the GES through their immediate superior to the CEMA and the Minister typifies at the highest level how the space *organigramme* has been designed to facilitate information gathering and communication within the structures. This rapidity of communication is one of the features most coveted by the US counterparts of French military space officials; it is estimated that the EMA/PPE is informed of any contact or proposition made to any part of the DGA or any firm involved in military space production within six weeks of the initial event. Rapidity of information transfer enables the decision-making instances to react immediately in the best interests of the French military space effort, and also in the best interests of the MIC.

9.4.2. Military space as a 'purposive' system

The military space plan itself is a good example of this tendency towards what might be termed institutional "self-defensiveness" or "homeostasis". As outlined above, the PPSM is relatively long-term (longer at least than the Military Programmme Laws), and is brought up to date every three years except when major uncertainty over the Defence budget prolongs discussion of the Programme Law, as was the case in 1989 and 1991. Because of the need to plan long-term in the space sector in terms of lags and time spans of development programmes and because of the dangers of financial restrictions upsetting the required stability of the programmes, the PPSM is presented separately to the Defence Minister for his preliminary approval before being included in the Defence Budget. In this way, the PPSM receives the backing of the Defence Minister before the overall budget is subjected to financial wrangling over budget cuts for the armed forces.

This innovation meant that although the 1989 military budget [31]and the *Loi de programmation militaire* 1990-93 were much discussed in the Autumn of 1988 and the Spring of 1989, leading to the eventual modification of a number of programmes,[32] the Minister of Defence Jean-Pierre Chevènement had already given his approval of the PPSM, as he stated at the Military Space Activities conference held in Paris in October 1989. In his closing speech at this conference, Chevènement concluded on the role of the state in coordinating the military and civil space sectors in the following terms: *'il faudra à la fois une*

grande souplesse et un véritable pragmatisme mais, dans le même temps une totale fermeté sur les objectifs et les orientations. Car rien d'important, aucun projet de longue haleine, ne se construisent dans le flou et l'improvisation.[33]

The function of the PPSM is to provide this flexibility and structure. The long-term projects of the space plan current when Chevènement made this declaration (in addition to what the Minister described as the *'renouvellement du système en cours'*, referring to *Syracuse* and *Hélios*) tentatively included the development of tactical listening systems in order to monitor enemy manoeuvres, the development of a radar satellite, and the creation of a space surveillance radar. The 'long-term' as a prerequisite of managing the military space sector as a system is not the only reason for the existence of the PPSM. Psychologically, there was a need to mobilise the defence establishment and the totality of the armed forces behind the concept of military space. At the same time there was a desire on the part of the military to have a military counterpart to the successes of the civilian space effort, especially since civilian research and development had always been more or less linked technically and financially to military R & D, essentially in the early years of the space industry, but successes had always been perceived by the public as civil. This is not to say of course that there was no reticence in certain spheres about the expansion of military space activities. The position of the *Groupe des Forces nucléaires* vis-à-vis the transfer of authority for space from the nuclear structures to the GES is a case in point. The attitude of the conventional forces was similarly ambivalent: whilst desiring a French military presence in space for reasons of prestige, they were initially ill at ease over the prospect of potential cuts in the conventional forces budget to finance the extension of space programmes. The operational as well as prestige value of space was however recognised by the conventional forces, and their uncertainty over the funding of space was finally overcome after the *Epervier* operation conducted in Chad in February 1986. In contrast to the logistic failure of the earlier *Manta* action in the Chad conflict, *Epervier* was a success, largely due to the efficient communications offered by the Syracuse I satellite system.[34]

Overall, the institutional structures and procedures of the military space sector, and the complementarity existing between the rôles of the EMA and the DGA show neatly how 'space' is both a strategic and technological challenge to the French defence system. The conflict that is apparent between the EMA and the DGA, its notional executant, illustrates how the technological and industrial aspects of military space policy tend sometimes to exert influence 'upstream' on strategic and political choices.

The creation of new structures in the mid-1980s such as the GES and the PPE reflected a number of concerns: firstly the desire to provide the institutional tools necessary for France to answer the SDI space challenge, and secondly, the concerns of the EMA and DGA to protect their own separate and combined interests. The composition of the organisms is such that the EMA hopes to maintain control over the technical/industrial hegemony of the DGA, at the same time as ensuring sufficient organisational efficiency and synergy within the military space sector as a whole to protect its interests against external political control by government. Within the Space Military Industrial Complex the military strategists are attempting to retain leadership in the determination of policy, and the complex itself is evolving towards a homeostatic existence justified by strategic/technical synergy, high-level political support outside the normal channels of cost benefit politics (the links with the Elysée and '*domaine réservé*' politics), and by closer cooperation with civil industry.

9.5. Funding for military space : past, present and future

Having presented the ways in which the organisation and principal characteristics of the space structures inside the Ministry of Defence tend to preserve the interests of all factions involved, and having alluded to the problems of finance caused by inter-service/inter-specialisation rivalry, we shall now briefly examine the funding of French military space activities in the 1980s. Such an analysis is hindered by the secrecy surrounding present levels of funding and by uncertainty about size of budget allocations in the past, when the percentage of the Defence Budget going to space was not calculated separately.

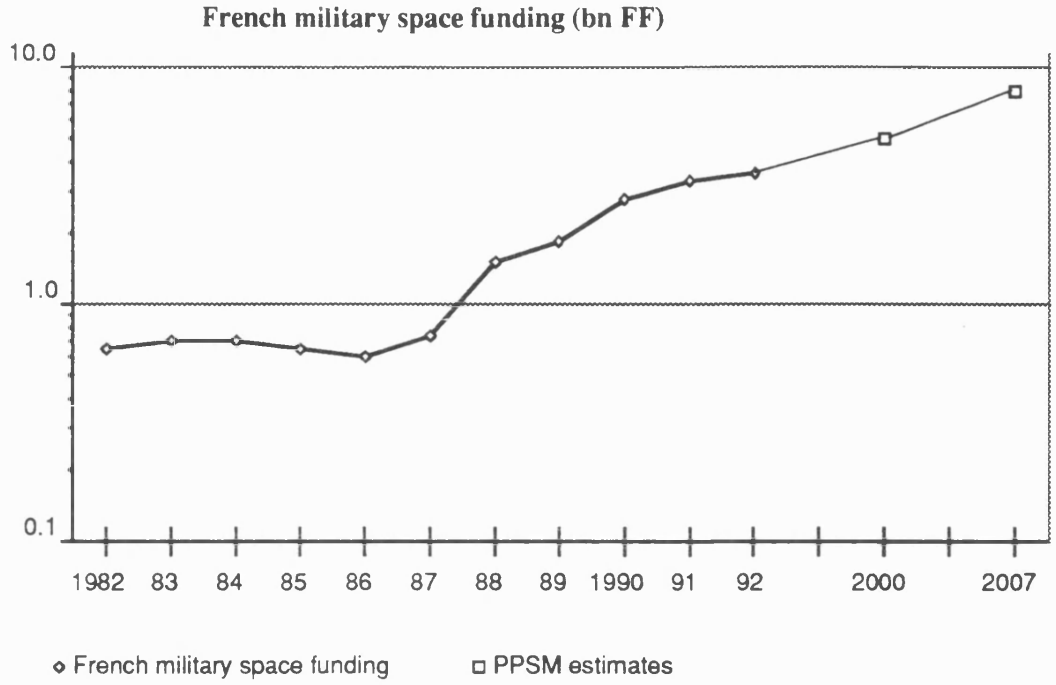
In order to situate the funding for military space in the context of the overall Defence budget a preliminary remark is useful: General de la Presle has stated that "the space budget should be calculated finely to correspond to the minimum of real requirements, since new money can only come from that devoted to existing projects".[35]

This affirmation takes on something of the status of an article of faith to the extent that both national politics in the form of the national budget negotiations and intra-armed forces inter-service politics are inflexible in their views on, respectively, increased military spending and redistribution of the "noble" elements of military activity such as space. The first part of General de la Presle's statement should be taken with something of a pinch of salt and the second as a more faithful reflection of EMA (if not DGA) thinking on funding.

The Defence Ministry budget in France is a subject of impassioned debate between those elements of government such as the Finance and Budget Ministries who give total priority to spending restrictions and those, in the armed forces and elsewhere, who claim that France must maintain her military capabilities in order to safeguard her rank in the world. Since the late-1980s, attempts by government to restrict military spending have become ever more pressing as a consequence of France's economic difficulties and of perceived lessening of tensions in the international system (peace dividends etc). Military spending as a percentage of GDP declined from 3.87 in 1981 to 3.8 in 1987 and before dropping to 3.37 in 1991 and 3.2 in 1992. This decline in funding for the armed forces formed the financial background to the discussions during 1991-92 over France's strategic, technical and funding choices which were induced by the Gulf War and by the need to review and renew the *Loi de programmation militaire.*

As well as providing the political will to support the armed forces' requests for greater access to space technology, the Gulf War-induced Joxe reforms also included organisational modifications, as we have seen, and one such reform of structures affects the funding of military space. This reform is the conflation of the EMA Space, Communications and Intelligence responsibilities under a single budgetary heading, a modification which is deemed to be both technically indispensable, so close are the linkages between these three fields, and the reflection of the political support for space.[36] Indeed, the strategic, technical and funding decisions for space in 1991, 1992, 1993 and beyond which emerged from this informal national debate confirmed its importance as a crucial element of French armed forces capabilities. We have already discussed the strategic and technical innovations brought about by Defence Minister Joxe's redefinition of the rôle of space in French military thinking, so we will here present briefly the evolution of funding for military space before and then after the Gulf War.

As the graph below shows, funding for military space went through two major phases in the 1980s. From 1981 to 1986 finance was actually reduced until the realisation of the importance of military space for the continued credibility of the FNS and the concomittant need to make up lost ground led to release of funds in the Military Law Programme for 1987-1991. During this second phase the trend of investment is such that estimates place funding for military space in 1995 in excess of French contributions to European Space Agency programmes. The year 1987 is taken by many as the date of launch of a significant military space policy with funding beginning to rise from the level of approximately 740 million francs.[37] In 1989 1.8 billion Francs were allotted to space.



(From Loi de programmation militaire 1992-94 and OPECST 'Rapport Loridant')

The graph also illustrates how in 1991 the military space budget reached 3.1 billion Francs, with a 17.5% increase in funding intended for 1992. Some longer term predictions place French spending on military space at 11 bn francs during 1992-1994 and 5 bn F per annum by the late 1990s, rising to 8 bn F post-2000. According to Jacques Isnard, the privileged defence commentator of Le Monde, classified funding studies in the Defence Ministry suggest that the *quinquennium* 1992-95 will see an annual 3% increase in funding for military space, amounting to a cumulative total of 85.2 bn francs.[38]

Figures for projected military spending tend to vary from source to source and, in the context of the debate over the *Loi de programmation*, with some rapidity, but it is nevetheless possible to distinguish some significant trends which imply that space will remain of growing importance to the French armed forces. The first of these trends was the short-term considerable increase in space funding from 1989/90 which gave the 17.5% rise in *crédits d'équipement* for 1992 and a 13% increase in 1993. Given the prevailing context of budgetary restrictions, such short-term increases were particularly noticeable because they took place against a background of a stable overall level of funding for the armed forces equipment budget. (The monetary 'stability' of funding levels is only relative, since in real terms, spending on defence is starting to decrease).[39] The total funding for equipment for 1992-94 was set at 308 bn francs, spread evenly over the three years at approx 100 bn per annum, and continuing the level of 103 bn francs set in 1991. As suggested by the earlier quote from General de la Presle,

increased spending on space, (even from a low level) thus competes with other spending needs, and one of the sources for space expenditures has been the nuclear branch of the Armed Forces' equipment budget. In effect, since 1990, spending on nuclear forces has declined from 30% of the equipment budget to 'only' 25%, whilst space and research spending has grown.[40] A large number of nuclear and conventional arms programmes have suffered in the 1992-97 program law in order to provide continued funding for space and research and other favoured fields, including the S4 MSBS ICBM (cancelled), the 'pre-strategic' Hadès missile (cancelled), the hunter-killer nuclear submarine (rescheduled) and the Mirage 2000 (rescheduled).[41] If the figures for equipment spending 1992-97 revealed by Isnard are worthy of trust, the 3% annual *increase* in space spending and 85 bn franc total stands in interesting contrast to the 6.6% annual *decrease* in funding for nuclear forces and the five-year total of 135 bn francs.[42]

Loi de programme 1992-94 : 'crédits d'équipement'	
Equipment category	% change 1993/92
Nuclear Deterrent forces	- 11.5
Space and Intelligence	+ 13.0
Research	+ 6.0
Conventional forces	+ 4.6

(adapted from Le Monde, 25 November 1992)

Joxe's principal innovation was to develop the panoply of space based technology at France's disposal. In terms of programs and costs, this has translated itself in the continuation of the *Syracuse* program, the extension of the *Hélios* series of satellites, the initiation of two new satellite programs named *Osiris* (radar) and *Zénon* (electronic listening), and the planning of a second generation optical observation satellite named *Songe* These programmes will be assessed in the following chapter.

9.6. Conclusion

This investigation of the organisation of French military space activities in the 1980s has revealed how the strategic and technical branches of the armed forces coincide in their enthusiasm for the 'spatialisation' of the French deterrent force,

and how both the EMA and the DGA are attempting to maximise their respective influence over the development of the spatial modernisation of the armed forces. Combined, the military space lobbies are thus overtly becoming an increasingly important force in the determination of overall space policy within France. However, given ever increasing costs for programs and despite the apparently privileged position of space within the defence budget, the stricture of financial restraint emanating from the Finance Ministry has increasingly relevant implications for the organisation of French military space activities : can programmes be undertaken nationally or does some kind of international cooperation seem unavoidable ?

The organisation of French military space is structured in a way that reflects the importance of space in new thinking on deterrent strategy and intelligence gathering. The space-related bodies in the *Etat Major des Armées* have privileged access to the highest échelons of military decision making and within the *Délégation générale pour l'Armement* the technical directorates concerned with space and the nuclear deterrent are the most prestigious and undertake the most 'noble' tasks. The presence of a tightly organised and efficiently running 'military space system' within the overall French space effort naturally creates the possibility of military and civil space coming into conflict. In general military and civil space 'coexist' satisfactorily, but the creation of the *Comité Delta* in 1991, which instituted a new link between the DGA and CNES suggested that the relationship between military and civil might be in need of some overhaul.

In the following chapter, we shall examine the closeness of the links between military and civil space in the military space technology procurement programmes, investigating the notions of civil-military 'synergy' and *'imbrication'*.[43]

Notes to Chapter 9

1 The PPSM was first instituted in 1983.

2 Interview, 3 September 1989, Paris.

3 Mendl, Wolf, Deterrence and Persuasion, French nuclear armament in the context of national policy 1945-1969, Faber & Faber,1970, pp151-152.

4 Kohl, Wilfrid, French Nuclear diplomacy, Princeton U.P. , 1971, p.5.

5 Mendl, Op. cit., p.75.

6 Sapolsky, H. M., Science, Technology and Military policy, p.457.

7 For a brief and succinct treatment of the rôle of the EMA see Haenel, H., La Défense nationale, PUF,1982.

8 For the development of the DGA since 1961, see Blanc, Emile, La Délégation générale pour l'armement : 25e anniversaire, Défense Nationale (April 1986), pp.1-25.

9 Sillard was initially appointed by Defence Minister Jean-Pierre Chevènement, and then given a second term as Délégué général in 1991 by Pierre Joxe.

10 The rôle of the different technical directorates of the DGA is presented in Délégation générale pour l'armement, DGA/Ministère de la Défense, May 1987.

11 Décret 91-929 and décret 91-930 of 16 September 1991, Journal Officiel, 19 September 1991.

12 Interview, EMA, April 1989.

13 Samro was first considered as far back as 1977.

14 F. Mitterrand, The Hague 7 February 1984, reported in Le Monde, 9 February 1984.

15 De la Presle, Bertrand and Pichoud, Daniel, L'Espace et Défense, Défense Nationale (August-September 1988), pp.37-49.

16 Mendl, Op. cit., pp.187-189 and Appendix, pp.227-229.

17 Le Monde, 5 June 1985.

18 Interview, EMA, April 1989.

19 The appointment of Saulnier to this post was perhaps evidence of a desire by the presidency to tighten control over goings on in the EMA after the Rainbow Warrior scandal of the previous year.

20 Telecommunications; high resolution observation; early warning and listening surveillance; navigation, oceanography, meteorology; space surveillance; launcher/satellite control/intervention in orbit and actions technologiques de base (research into essential technologies).

21 Although much of the exact content of the PPSMs naturally remains classified, the general objectives of the current Plan were concisely set out in the Loi de programmation militaire for 1992-97 as being 'a complete information-gathering system including optical, infrared and radar military satellites integrated with the C3I structures of the armed forces and a planned replacement of these facilities for 2010. See Loi de programmation militaire 1992-97, p.352.

22 The last phase of the current PPSM requires European cooperation. (Interview, EMA, April 1989).

23 As reported by Guisnel, Jean, in Libération, La France met son renseignement à la page, 7 May 1991, p.2.

24 See Guisnel, Op. cit. for report of the initial uncertainty over the proper place for the Hélios control and exploitation bodies.

25 See Isnard, Jacques, Les "yeux", les "oreilles" et le "cerveau" de M. Joxe, Le Monde, 21-22 June 1992, and Les armées recréent des cellules de renseignement, Le Monde, 26 July 1992.

26 The Council of Ministers held on 12 February 1992 discussed the desirability of increased exchanges between civil and military research, citing the example of a CNES-DGA agreement negotiated within the framework of the Delta Committee and a CNES/Defence ministry/Research ministry research programme on hypersonic flight. See La Lettre du CNES, no.137, April 1992, p.26.

27 In May 1992, the need for concertation between civil and military space was again stressed by the then Research and Space minister Hubert Curien during the *Science et Défense* Conference. See La Lettre du CNES, no.138, June 1992, p.27.

28 Wall Street Journal 28 July 1988.

29 In 1988 the US military space effort was estimated at $24 bn, see Villain, J., Programmes et budgets spatiaux militaires dans le monde, L'Aéronautique et l'Astronautique, (1989-3-4, Nos. 136-137), pp.52-59.

30 The GES cabinet is composed of representatives from the EMA,the DGA and from the *Direction des services financiers.*

31 See the Le Monde reports on the 1989 Budget bill, 17 September 1988 and 24 September 1988.

32 Loi de programmation militaire 1990-1993, *Conseil de Défense* 2 June 1989, *Conseil des Ministres* 7 June 1989, S4 missile programme frozen as *'veille technologique'*, see Le Monde, 25 May 1989.

33 J-P. Chevènement, speech given at the *Activités spatiales militaires* (ASM) conference, 26 October 1988, Paris. Reprinted in La DGA à Technospace, (DGA/Ministère de la Défense, December 1988).

34 Interview, Division PPE, Defence Ministry, April 1989.

35 *'la part du produit brut intérieur marchand au profit de la défense étant déterminée, tout système spatial doit être financé par prélèvement sur des systèmes existants qui avaient leur place dans cette ressource. Il importe donc de ne consacrer à l'espace que ce qui est strictement nécessaire à la satisfaction des priorités réelles.L'Espace et Défense'*, Défense Nationale (August-September 1988), p.43. This quote of course reflects the political statement that space is not to be seen as a funding absorbing bottomless pit of technical megalomania. Its adequacy as a reflection of reality is belied somewhat by Budget ministry unhappiness at the inefficiency of control over space budgets and the obvious strength of the technical lobbies within the DGA.

36 See IGA Bousquet, La quatrième dimension, Armées d'Aujourd'hui no.170. pp.33-35, p.34.

37 De la Presle, Bertrand and Pichoud, Daniel, L'Espace et Défense, Défense Nationale (August-September 1988), p.43.

38 The projected figures for future spending on military space tend to vary somewhat. These are the best official indications available from a variety of sources, eg.; Loi de programmation militaire 1992-1997, pp.354-355, OPECST Rapport sur les orientations de la politique spatiale française et européenne, p.167., and Isnard, Jacques, Les principaux programmes d'armement coûteront 622 milliards de francs entre 1992 et 1997, Le Monde, 25 November 1992, p.9.

39 See Isnard, Jacques, La défense au ralenti: le budget de M. Pierre Joxe amorce une diminution à plus long terme, Le Monde, 2 September 1991,

40 Research is another priority for spending since the Gulf war and Joxe's reforms and benefited from a 6% increase in 1992 funding from 30 bn francs per annum level of funding. See Nouvelles priorités pour la recherche de défense, Air et Cosmos no.1333, 27 May-2 June 1991, pp.32-33.

41 See Défense: Joxe programme la grande mutation, Libération, 2 July 1992, p.8.

42 See Isnard Jacques,, Les principaux programmes d'armement coûteront 622 milliards de francs entre 1992 et 1997, Le Monde, 25 November 1992, p.9. As Isnard also points out, beyond 1997, these trends of expenditure may well change again.

43 It must be noted that 'synergy' as a term is applied both to EMA-DGA cooperation and to civil-military interfacing in R&D and industry.

10. Theory and practice of military space procurement

This chapter looks at the reality of military space in terms of the planning and development of military space programmes. It discusses the principles of military procurement and how these are applied in the practice of missile and satellite production. In so doing it examines the links between military and civil in the 'military' programmes. The analysis shows how military and civil strands in the making of policy coincide to some extent in the military space programmes.

In considering the procurement of military space technology, attention must be paid to the way in which military technology becomes necessary. Is strategy technologically led, or do military technologists provide only the equipment required by the strategists to guarantee the most cost-effective defence of the nation? This is the question of the 'sociology' of decision making addressed as part of the analysis of the previous chapter. In terms of theory, positions on this question range from the 'technological determinists' evoked by Sapolsky[1], who believe that everything that is feasible in weapons technology will be produced, to the assertion that 'new weapons. . . are less the product of technological forces than they are of institutional and socio-political factors'.[2] Analysis of programmes tends to lead to the conclusion that the development of arms technology is most likely to be a result of interaction between available and required techniques and various non-scientific constraints.[3] This 'interactive' understanding of the relationship between technologists in industry and the military administration appears valid for the French case, as De Rose, former member of the CEA board of directors, representative to CERN and head of the *Service des Affaires atomiques et spatiales* in the Defence Ministry has implied, speaking of the *'interaction permanente entre l'évolution technologique et les concepts de défense*[4]. In this chapter we examine the ways in which the satellite and missile programmes are actually undertaken in reality.

The structure of the chapter is as follows :

- **10.1.** The theory of military space procurement
- **10.2.** The practice of military space procurement : Syracuse
- **10.3.** The practice of military space procurement : Hélios
- **10.4.** The practice of military space procurement : IRBM programmes
- **10.5.** Theory and practice in perspective
- **10.6.** Conclusion

10.1. The theory of military space procurement

Procurement for space-linked military systems in France follows essentially the 'normal' patterns of procurement for conventional material. There are however certain differences in the exact organisation and management of the procurement programmes which result from the nature of the systems themselves and from the structure of the space industry. As we shall see, the structure of the space industry has particularly interesting consequences on the mechanisms of procurement. The usual procedure for procurement[5] upon which space programme development is based is as follows.

For a *programme d'armement majeur* whose final product is intended to answer the *besoin militaire* identified as a potential weakness in France's defensive posture, the procurement process consists of three main stages. In the *stade de définition,* (or definition phase) a *groupe technico-opérationnel* undertakes studies of potential military systems which would answer the weakness. This initial step is classed as a *démarche prospective* (or planning initiative) As its name implies, the *groupe technico-opérationnel* is composed jointly of officers drawn from the *Etat Major des armées* (EMA) and military engineers from the *Délégation Générale pour l'Armement* (DGA), being presided by an EMA officer and a DGA engineer. The dual nature of the group's composition enables its analysis and evaluation of the weapons systems to cover four major themes. Firstly, a precise definition of the military uses envisaged for the systems is drawn up. Secondly, the various technical propositions for the systems up to the stage of project are evaluated. Thirdly, the possibilities of international cooperation are considered, and finally, industrial partners competent to produce the systems are identified.

The actual decision to proceed with any given proposed major armaments program is made by the Defence Minister or by the *Délégué Général pour l'armement* on the basis of a *dossier de lancement* prepared by the division of the DGA entrusted with the technical aspects of the military need in collaboration with the EMA, author of the initial expression of the need. Once accepted, the dossier leads to the second stage of procurement; the *stade de réalisation* (or production phase). This *stade de réalisation* itself comprises two phases, the first of development, and the second of manufacturing. These two phases in fact overlap in time since the *matériel*, soft-ware and back-up are conceived in their final form, tested and eventually manufactured by the industrial partners designated over a sometimes quite significant time period. In order to make this process as efficient as possible, the development and production of the system are coordinated by a

directeur de programme who ensures the smooth running of the programme and effective liaison between the DGA division directly involved (*la direction menante*), the EMA and industry.[6] The third and final phase of the procurement process is the integration of the system into the defence of the nation, thus leading to the *stade d'utilisation.*

In this way the conduct of an armaments programme necessitates a bipartite system of concertation between staff officers from the EMA and technical experts of the various divisions of the DGA. These partners determine the nature of the relationship between the military and industrial enterprises which are called upon to realise the weapons systems. Major armaments programmes are so defined on the basis of their military importance, their innovatory technical content, their cost, their industrial consequences and their international ramifications.

The two current military space programmes (Syracuse and *Hélios*), are both classed as major programmes. We deal with the military importance of these space based systems elsewhere; similarly, their cost is analysed in our treatment of spending on military space projects. In this section, our principal concern is to examine the nature and workings of the relationship between the military space establishment and civilian industry.

The consequences of the two major space armaments programmes on industry are considerable both in terms of the contracts passed with the space divisions of the principal firms of the space industry, and in terms of the organisation of the collaboration between the EMA, the DGA and CNES. As major programmes, Syracuse and *Hélios* have the same general organisational structure as outlined above. However, since there exists a 'rival' source of technical expertise to that of the DGA in the form of CNES and *France Télécom* in the fields of earth observation and space telecommunications, these institutions are involved in the organisation and execution of the programmes. The bipartite concertation thus becomes tripartite under the form EMA-DGA-CNES (*Hélios*), and EMA-DGA-*France Télécom* (Syracuse).[7]

10. 2. The practice of procurement : the Syracuse programmes

'Syracuse' is the near-acronym standing for *SYstème de RAdioCommunication Utilisant un SatellitE.* The term covers two generations of systems: Syracuse I and Syracuse II. Syracuse II is not yet in service, being planned to replace the earlier system in 1992, when the original satellites reach the end of their seven-year operational life. Syracuse first came into practical use in August 1984, and

the planned ten year life span of the Syracuse II satellites should ensure the reliability of the system until 2002. Choices made now and even further back in the late 1970s thus have considerable importance when one considers the time span over which errors in specification or of technology may arise. The precise function of satellite radiocommunication is to allow the transmission of telegraphic, telephone or data communication from one point of the globe to another via a transmitter, a satellite relay and a receiving ground station. In addition to these basic facilities of obvious military usefulness, the Syracuse II system will enable liaison with the RITA battleground communications network[8] and with the fourth generation army radio. The creation of the whole system thus implies the production of control centres, transmitters, satellites and ground stations. The ground stations are either fixed or mobile, the latter type including naval or airborne receivers as well as lorry-transported stations. The exact nature of the satellites and of their corresponding ground stations and control centres differs between the Syracuse I and Syracuse II networks as a consequence of their origins and development, which we shall now examine. Mention will also be made of the industrial organisation of the programmes, a subject which will be treated in more detail after the presentation of the genesis and characteristics of the systems themselves.

10.2.1. Syracuse I

Syracuse I shows how the procurement process worked in the space industry, combining military and civil expertise.

The initial impulsion for the acceptance of Syracuse I as a major armaments programme came in 1979 from a group of officers in the various *Etats-Majors*, the foremost amongst whom was Admiral Bovis. The programme was given official approval by the Ministry of Defence on 17 January 1980. Feasibility studies for radiotelecommunications had been going on for some years prior to this however; the final form of the system was derived technically from a series of experiments baptised SEXTIUS carried out over the period 1975-79.[9] These studies, effected by the *Centre d'Electronique de l'Armement* (CELAR) and by the *Service technique des Constructions et Armes navales* (STCAN) using the Franco-German telecommunications satellite *Symphonie* proved the usefulness and possibility of producing such a system. Although considered potentially useful, the production of a solely military satellite was not deemed warranted because of the restricted volume of purely military communications at the time of the Sextius operation. It was not until the announcement of the PTT telecommunications satellite *Télécom*

1 in 1978, and the consequent opportunity of sharing the satellite payload between civil and military uses that the project of developing a military telecommunications facility, albeit in a shared form, was reconsidered. The principal stumbling block to a military system distinct from civilian cooperation was cost. The *Télécom 1* programme was launched officially in February 1979, with the military participation in the programme being consecrated in a PTT-Defence Ministry Protocol. This would seem to imply that there is no technical hegemony of military space over civil, but rather a military exploitation of synergies with the civil sector.

The *Telecom 1* / Syracuse I programme consists of three DGA commissioned *Matra* satellites carrying military cartridges integrated with the civilian payload. *Telecom 1A* was launched on August 4 1984 by the first Ariane 3 rocket; *Telecom 1B* was launched on May 7 1985 and *Telecom 1C* on 11 March 1988.[10]

The Syracuse I programme shows how even in the earliest initial stages of the programme the '*besoin militaire*' identified by the EMA quickly became a DGA project (CELAR/STCAN), and how it also implied synergy with the civil sector in its use of the *Symphonie Télécom* project. It also shows how the civil telecommunications budget can be seen as a means for the military sector of bypassing the financial constraints alluded to by General de la Presle

10.2.2. Syracuse II.

Preparatory studies for the Syracuse II programme were initiated by the DGA in 1983 in anticipation of the seven year life span of the *Télécom 1* satellites and the consequent replacement date of 1991-92 for the maintenance of the military communications system. The preparatory studies arrived at a number of technical options for the future system. The *projet de définition* that was eventually retained by the Defence Minister on 20 January 1987 took cost considerations into account in the form of an agreement between the Ministry of Defence and the civilian *Direction Générale des Télécommunications* (DGT), part of the P.T.T. Ministry, for the joint production of the spatial element of the *Telecom 2* programme.

Preparatory studies	1983
Programme launched	1987
Satellite launches	December 1991 April 1992
Planned end of operational life	2001 -

(Sources : various)

Prior to the final acceptance of the project by the Defence Minister, the protocol of agreement between the DGA and the DGT provided for the joint research, development and production of three joint DGA-DGT satellites sharing military and civil payloads, the launch of two of these satellites and the design and installation of a satellite ground control centre for these *Télécom 2* satellites.

With Ariane launches in December 1991 (Telecom 2A) and April 1992 (Telecom 2B), the *Télécom 2* satellites will fulfil essentially the same operational requirements as their predecessors in the Syracuse I system except that Syracuse II will have greater flexibility of use than the earlier system because of the greater power and complexity of the *Télécom 2* satellite platform and its military payload. The new satellites will exceed two tonnes in weight and will have an operational life of ten years. The increased weight and complexity of the second generation satellites is a consequence of two factors: firstly the increased volume of military communications expected to pass through the satellite has given a doubling of the number of relays (from 2 to 5); and secondly, the satellite has to be 'hardened' against potential anti-satellite action (including remote control independent of PTT control systems in case of failure or attack). The increased importance of military space over the period of the Syracuse I system is vividly illustrated by the threefold increase in the mass of the military components of the joint satellite from one sixth to one half of the payload. Overall, the number of ground stations will be greatly expanded, increasing from twenty-six to approximately 100 coming into service over the period 1991-95.[11]

These are thus the principal operational and technical features of the Syracuse programmes showing the military use of the satellites and how their genesis and development, even in the earliest stages have involved cooperation with civil activities, in particular with the telecommunications branches of the P.T.T. Ministry.

It remains for us to discuss the organisation of the programmes in terms of the partners with whom the Ministry of Defence works to define and produce the satellites and their accompanying systems, in other words practical programme synergy. A brief analysis of military procurement procedures as they relate to the space sector has been given above, as Syracuse is a major armaments programme its industrial and institutional organisation reflects some of the innovations of these procedures.

10.2.3. Mistrust and close cooperation

On the institutional level, Syracuse II is led by the DGA and by its *Direction de l'éléctronique et de l'informatique* (DEI). Throughout the organisational chart of the programme, representatives of the *Etats Majors* and of the *Etat Major des Armées* participate in the development of the system in order to ensure the smallest possible divergence of its final characteristics from the military requirements originally expressed by the EMA.[12] The smooth running overall of the programme is ensured by the *Comité directeur* presided by the head of the DEI and composed of EMA representatives and engineers from the DGA divisions involved. Reporting to the *Comité directeur* are the *groupe opérationnel* and the *groupe technique*. The former of these represents the *Etat Major* in the development of the programme, being presided by the head of the EMA's Telecommunications, Electronics and Computing division. Its members are drawn from the staff headquarters of the three armed forces. The second group, the *groupe technique* , headed by the *Directeur de programme,* also participates in the proceedings of the Operations group, being itself responsible for the day-to-day running of the programme, coordinating the production of the different components of the system and checking that cost, quality and deadlines are respected. The programme director is assisted by the *responsable de la composante spatiale,* (who is simultaneously *directeur de projet adjoint* of the *Télécom 2* programme), and by the *responsable de la composante sol* (the ground segment). The installation of mobile groundstations on ships, lorries and aeroplanes leads the technical group to liaise with the *directions coopérantes* of the DGA (the divisions responsible for naval construction, ground vehicle production and planes : DCN, DAT, DCAé) and with CELAR, the Defence Ministry electronics centre. The membership of the group is made up of representatives of the staff headquarters and of the DGA and the *officier de programme*. The programme officer is an EMA officer in charge of the *équipe de marque* Syracuse II which provides a forum for the EMA to meet with representatives from the different arms.

Syracuse II is of course inseparable from the civilian programme *Télécom 2 :* as we have seen, the officer responsible for the spatial component of Syracuse II is at the same time the vice-director of *Télécom 2*'s *direction de projet*, or project management team. The terms of the agreement between the DGA and the DGT provided for *Télécom 2* to be undertaken by a project leadership under the direction of a *Comité de programme*. The programme committee is presided by an official of *France Télécom,* and is composed of twelve members, four drawn from CNES, four from *France Télécom* and four from the Ministry of Defence.

The *direction du projet* is assisted in the management of the programme by an *équipe de projet* made up of engineers from *France Télécom*, CNES and the DGA-DEI/CELAR.

Far from being mere detail, these features of the organisation and management of the programmes show how far the military and civil space sectors work together in '*imbrication*'. '*Imbrication*' implies the close intertwining of 'separate' entities; the 'separateness' of civil and military activites is in fact revealed by the relative mutual distrust which necessitates the complicated joint leadership of projects and checks and controls by EMA, DGA and CNES. We shall return to this notion in the evaluation of the military space procurement procedures as a whole.

Syracuse I / Télécom 1

Program Leaders	Space segment	Ground segment	Launch
DGA + CNES + DGT (France Telecom)	Prime contractor = Alcatel / Matra Satellite platform = Matra/Alcatel	Prime contractor = Alcatel Ground control = Matra Alcatel/Thomson	Arianespace

Syracuse II / Télécom 2

Program Leaders	Space segment	Ground segment	Launch
DGA / DEI-CELAR + CNES + DGT (France Telecom)	Prime contractor = Alcatel Espace Satellite platform = Matra Payload = Alcatel	Prime contractor = Alcatel MatraAlcatel/Thomson Mission control = CNES/ GIE Sat-Control + ATFH	Arianespace

Two further examples of the close links between the military and civil space programmes are the Samro and Hélios satellites.

10.3. The practice of procurement : the Samro and Hélios programmes

Hélios is the French armed forces' current observation satellite programme, the launch of the first satellite of a series of three or four being planned for 1994. The

success of the Hélios programme in the later 1980s and 1990s contrasts with the difficulties of the SAMRO programme in the late 1970s and early 1980s.

10.3.1. Samro : a failed military observation satellite

SAMRO was the French military's first attempt to create a space surveillance system, unfortunately doomed to fail despite the agreement on the usefulness of the system proposed and on the capacity of French and European industry to produce the technology required. The current *grand programme d'armement Hélios* is however derived from the studies made for SAMRO and perhaps also from the lessons learned from the eventual failure of the project.

The acronym SAMRO stands for *SAtellite Militaire de Reconnaissance Optique*. The need for such a facility first became felt in French military circles in 1977, and interest focussed on a proposal made by the *Groupe des Forces nucléaires* in the EMA, the body responsible at that time for reflection on the military aspects of space. Between 1977 and the end of 1985, the DGA devoted considerable funding to studies on satellite reconnaissance techniques in addition to contributing 30% of the total funding for CNES's civilian observation satellite, SPOT. It would seem however that DGA interest in cooperation with CNES began seriously only in 1981, a year before the burgeoning costs of the solely military satellite SAMRO led Defence Minister Charles Hernu to cancel the preliminary studies into the project in mid-1982.[13] It is important to realise that SAMRO was never actually launched as a programme, the project remaining at a preliminary level of studies, however successful. Officials are anxious to point out that SAMRO never existed as an individualised item in the Defence Budget.[14] The studies were so advanced indeed that 1982 could have seen the launch of SAMRO as a major development programme. Hernu's decision on the contrary to shelve the initiative because of financial imperatives led to considerable doubt in military and political circles as to the precise commitment of France to military space. The fact that continued studies into two crucial techniques for military reconnaissance by satellite were authorised as a kind of *veille technologique* did little, in the absence of any engagement to transform the project into *Hélios,* to allay public debate over the uncertainty of France's position vis-à-vis military space. In the face of opinion such as that of Senate Defence Commission *Rapporteur* Jacques Genton that SAMRO was of 'capital importance' for the *Force océanique stratégique* (FOST), or nuclear submarine fleet,[15] the decision to shelve its development almost indefinitely led commentators such as Patricia Chilton to remark that the satellite programme was the subject of one of the most asked and

least answered questions of the 1983 Defence law debates.[16] In industry as well, concern arose over the lack of government interest in military space: in June 1983 Pierre Usunier of *Aérospatiale* and Jean-Luc Lagardère of Matra, two of the biggest actors in the French MIC, expressed their disappointment at the small scale of military programmes.[17]

10.3.2. Hélios: '*coopération franco-française*' and '*synergie internationale*'

The SAMRO studies were in fact transformed into the *Hélios* programme [18]. The studies that Hernu authorised were into the specifically military elements of an eventual armed-forces-civilian satellite, namely the optical viewfinder and a magnetic recorder.[19] *Hélios* was included in the Defence Ministry budget for the first time in late 1985, and its development in cooperation with the CNES programme SPOT was approved by the Ministry of Defence in February 1986, only to be the subject of a cost reappraisal by the new Chirac government in 1987, leading to its final inclusion in the *Loi de programmation* 1987-1991. The first satellite was expected to become operational in 1993.

The *Hélios* programme as it currently stands is an example of *'coopération franco-française'* (a kind of military-civil industrial synergy) between the Ministry of Defence/DGA and the SPOT programmes conceived and developed by CNES and managed by the CNES subsidiary SPOT Image. *Hélios* also represents the innovation of small scale international cooperation in military space systems since Italy and Spain contribute 14% and 7% respectively of the development costs in exchange for proportional access to the operational facilities of the satellite. During 1984-85 however, discussions also took place between the French and West German Defence Ministries concerning West German participation in *Hélios*, but agreement was never reached, avowedly because of problems in financing such cooperation in Bonn.[20] The German refusal to cooperate, after the setting up of a joint working party on the issue, and despite West German agreement over the political value of the initiative caused disappointment and even rancour in France. After a speech by Hernu in May 1985 at the *Institut des Hautes Etudes de Défense nationale* (IHEDN), France's most prestigious forum for debate on defence policy, in which he stressed the need to organise space activities in the interests of Europe[21], and within the context of new French commitment to modernizing the organisation of military space structures, West German withdrawal caused incomprehension in Paris. Whilst still holding out hope for future cooperation in a second generation satellite system, the French tried to understand the reasons for their partner's reluctance. The lack of money for such

a project was an obvious motive, but there were technical and political reasons as well. Technically, there was support in the Federal Republic for a radar satellite rather than an optical system such as SAMRO-SPOT-*Hélios* (discussions over the proposed European fighter aircraft had seen the FRG demanding a configuration answering *German* needs) and with German/East European territory often obscured by cloud cover, existing German expertise in radar seemed a convenient justification for a radar satellite. This explanation has however been rejected by representatives of the French Ministry of External Relations, who saw the German position as being more one of differing time scales for the need for satellite observation, rather than fundamental disagreement over specifications.[22] The French military accepted both these factors as potential explanations for German refusal, and also, considering the strategic-diplomatic level, suggested that the Germans were hesitant to develop an independent satellite reconnaissance capability for fear of implying reduced confidence in American information sharing, or even a move away from cooperation with the US. This view (expressed by General Fricaud-Chagnaud of the SGDN), implied that one of the reasons for French interest in an independent satellite was to check information given by Allies. Indeed, part of the General's formulation of the problem seemed to contradict to an extent the view that *Hélios* is absolutely indispensible for the FNS, by saying that it was not necessary or imperative that the French be able to observe everything all the time, because they had agreements with allies to give them satellite intelligence. '

However, he went on to add that if France were herself to possess independent satellite facilities, this would oblige allies to help her with accurate information.[23] The tone of the second part of the statement revealed a persistent suspicion of their American allies typical of the post-Gaullist French military establishment, a mistrust motivated by the desire to remain independent in all ways and at all times, from friend and foe alike. It is the persistence or demise of this kind of attitude in the longer term which will eventually condition the success of French integration into European defence policy, and which in the medium term term will determine the nature of French industrial participation in joint military procurement programmes.[24]

The *Hélios* programme seems to have thus already tested the limits of some kind of '*synergie internationale*' in the European space armaments sector. The institutional and industrial organisation of the *Hélios* programme represents the latest version of cooperation between the Ministry of Defence and the civil space sector. In effect there are of course three major actors in any collaboration in this field: firstly the DGA and its specialised '*directions*'; secondly CNES, and thirdly the

high-technology companies involved. The public aim of cooperation between military and civil space instances is that of 'synergy', and the reductions in cost and increased efficiency in terms of research and development that this implies. The synergy that the *Hélios* programme creates is not so much that of a meeting of opposites (civil and military space efforts) as of a coming together of already ambiguous activities. For example, CNES is a strictly civil body, whose statutes preclude it from working on military projects, it is however a state organisation thus entertaining a privileged relationship with the Ministry of Defence. In a similar fashion, the industrial companies themselves are not purely private enterprises, many are nationalised or state owned such as *Aérospatiale* and *Thomson.* The synergy is therefore to a certain extent already existing in a latent form as a consequence of the historical development of the space sector in France.

The counterpart to the search for *'synergie'* is, as always, the need to safeguard the eventual fulfilment of the operational requirements stated by the *Etat Major.* This necessity is institutionalised in the organigramme of responsibilities for *Hélios.* The innovation of *Hélios* is that CNES expertise is called upon in the running of the programme. Under the terms of a convention between CNES and the Ministry of Defence signed in early 1987, the overall management of the programme is entrusted to the DGA.[25] This *'direction du programme'* (or *comité directeur*) within the DGA delegates authority for the overall design coherence of the system to CNES. Ultimately the programme comes under the authority of the *Délégué Général pour l'armement* who appoints the *directeur de programme* from within the DEN, who then presides the *comité directeur* assisting the *directeur de programme* in the realisation of the project. Whilst the overall homogeneity of the system between civil and military requirements is guaranteed by CNES, who are also responsible for the development of the space-borne elements of the system, the DGA/DEN retains influence over the purely military ground station equipment for processing the satellite data. Under the '*maîtrise d'ouvrage*' or prime contractorship of the DGA/DEN, *Aérospatiale*, *Matra* and SEP are entrusted with the overall production of this material. The corresponding *maîtrise d'ouvrage* for the spatial system is held by CNES, with *Matra* exercising the *maîtrise d'oeuvre industrielle* for the satellite platform itself. The choice of *Matra* was more or less unavoidable since SPOT 1, 2 and 3, the previous generations of the civilian satellite upon which *Hélios* draws were produced by *Matra* in association with *Aérospatiale, Alcatel Espace* and SEP. *Hélios* will share characteristics and equipment with the new generation of satellites represented by SPOT 4.[26]

Hélios

Program Leaders	Space segment	Ground segment	Launch
DGA / Direction des Engins + CNES	Prime contractor = CNES Satellite platform = Matra Control system = Alcatel Optical equipment = SNIAS	Prime contractor = SNIAS / Matra Mission control = SNIAS Image treatment = Matra/ SEP Image reception = Selenia spazio / Inisel	Arianespace

Hélios is an interesting programme because the eventual decision to undertake it after a considerable period of a mainly financially inspired hesitation coincided with the mid-1980s awakening of interest in military space and the realisation that France must not be left behind. The programme is equally interesting in the way that it presents the latest version of *coopération franco-française*, whilst at the same time demonstrating the persisting political and strategic obstacles to the evolution of synergy from an essentially national solution to military challenges and financial constraints to an international security feature (in other words a European defence satellite) based on international scientific and industrial cooperation.[27]

10.4. The practice of procurement : IRBM programmes

According to the Larousse *Dictionnaire de la Défense et des Forces Armées*, the definition of a missile is as follows: *'Nom militaire de la fusée. Comme elle, le missile est un corps projeté dans l'espace qui comporte les éléments nécessaires à sa propulsion, mais sa tête (ou ogive) porte une charge destructive, alors que la fusée porte une charge "civile" telle qu'un satellite.*[28] Despite the clarity of this definition, and especially the link that it establishes between the civil and the military aspects of space ballistic technology, there seems to exist within the French defence establishment an almost "doctrinal" refusal to consider the strategic ballistic missile as a spatial element of France's defence.[29] It is perhaps true that this refusal can be justified under the largely administrative grounds that since the missile is a nuclear vector it is best classified under that heading. Against this taxonomic justification, however, we would oppose the common sense notion (supported by historical, industrial and operational arguments) that strategic ballistic missiles are so closely linked with space technology that their development and production must be examined in a study of military space policy.

So, despite official reticence, we shall consider the strategic missile programmes as a more or less integral part of the military space effort.

The ambiguity of missile technology between civil and military uses is of course typical of technology in general, as Jacques Ellul has stressed.[30] A recent example of this definitional problem is afforded by the controversy between the US State Department and *Arianespace*, accused of intending to sell Brazil the technology of the Ariane Viking motor.[31] If the Viking motor is considered susceptible of being transformed into a military propulsion unit, this sale would be in contravention of the 1987 international agreement on missile technology transfers. In support of their action, *Arianespace* advanced the argument that the liquid fuelled Viking motor is ill-suited to military purposes, military rockets usually relying on solid fuels. Unfortunately, however, this nice distinction is belied by the claims of the DEN's *Service technique des Poudres et Explosifs* (STPE), which boasts that *'la propulsion par moteur fusée à ergols liquides...présente également un intérêt pour les programmes militaires...c'est un mode de propulsion particulièrement adapté pour les parties supérieures de missiles stratégiques à têtes multiples.*[32] The DEN's statement that studies on basic technology and applications are in hand supports the case that civil and military rocket programmes are closely linked, and weakens *Arianespace*'s defence of their technology transfer.

These IRBM missile programmes are managed by the *Service technique des Engins* (STEN) of the DEN/DGA, with the STPE contributing expertise on propulsion. The missiles are of two main kinds: the sea-to-ground *Mer-Sol balistique stratégique,* (MSBS), and the ground-to ground *Sol-Sol balistique stratégique,* (SSBS). The former are naturally launched from the nuclear powered submarines of the FNS, the *Sous Marins nucléaires lanceurs d'engins,* (SNLE), and the latter from silos in the *Plateau d'Albion* in Provence. A third kind of missile has been very much in discussion at various times during the 1980s, namely a mobile strategic system capable of supplementing the land- and sea-based deterrent forces.[33] These discussions have been partly a consequence of developments in the strategic environment caused by the USSR's new stance on disarmament, and remain relatively unresolved. The disagreement between factions in the military and political establishments over the necessity of a mobile arms system illustrates how some changes in strategy may instigate changes in technology as well. After looking at the major missiles programmes (whose basic features are presented in tabular form below) and the way in which they have been affected by the major changes in the strategic environment of the 1980s,

(SDI and Disarmament), we shall also consider the industrial aspects of missile development.

IRBM programmes

Programme Leaders	Warhead	Propulsion system	Rocket / guidance	'Launch'
DGE-DEN-STEN / SNIAS	CEA	SEP / SNPE	Prime contractor = SNIAS-DSBS sub-contractors - Matra - DCAN/DCN - etc	SNLE / Plateau d'Albion

10.4.1. The *Mer-sol balistique stratégique* (MSBS) programmes

Two missiles are currently in service. The M-20, a 3,000 km range single thermonuclear headed missile became operational in 1977 and is carried by the majority of the submarine force. The M-4 (the current generation of multiple thermonuclear headed missiles) equips the *Inflexible*, the most recent of the FOST submarines, which entered service in 1985. M-4 missile improvements constitute the major ongoing missile programme, along with preparatory studies for an M-5 system and the intermediate technology M-45 initially destined to equip the first of the new generation submarines (SNLE-NG), the *Triomphant*, in 1994, but postponed since the 1989 defence budget problems until 1996. The table below shows the various missiles which have been operational since 1971 :

MSBS Missiles

	M1	M2	M20	M4	M45	M5
Commission	1971	1974	1977	1985	1995	2005
Range	2500 km	+3000 km	+3000 km	5000 km	5000 km	10000 km
Warhead	Single. Nuclear. 500 kT	Single. Nuclear. 500 kT	Single. Thermo-nuclear. 1 MT	6. Thermo-nuclear. 150 kT.	6. Thermo-nuclear. 150 kT.	12. Therm-nuclear Classified
Hardened	N	N	Y	Y	Y	Y
Stages	2	2	2	3	3	Classified
Height	10.4 m	10.4 m	10.4 m	11.05 m	11.05 m	Classified
Diameter	1.5 m	1.5 m	1.5 m	1.93 m	1.93 m	Classified
Weight	20 t	20 t	20 t	35 t	35 t	Classified
Submarine	SNLE (1st generation)				SNLE (New generation)	

(Modified from Air et Cosmos, no.1360, 6-12 January 1992)

Improvements to the M-4 were decided in 1984, a year before their formal entry into service, by the then Defence Minister Charles Hernu.[34] The 1985 budget allowed 116 million francs in *crédits de paiement* and 550 million francs in *autorisations de programme* for this development work. The willingness to maintain a kind of "*veille technologique*" (and *stratégique*) over the development of improved missiles was illustrated by Hernu's Senate declaration in December 1984 when he stressed the readiness of the technologies required: *'La décision de développement sera prise en fonction de l'évolution de la situation. L'effort de recherche et d'études se situe à un niveau très important qui nous permettra, le moment venu, de faire les meilleurs choix technologiques.'*.[35] The studies being carried out on the M-4 and M-5 arms systems cover two main areas: systems work on new missiles, components and the militarisation of space, and the improvement of existing systems through work on fuels, motors, warheads and electronics.[36] The TN-71 warheads are multiple, miniaturised and hardened against defensive measures.

In the face of criticism from the Opposition that Defence was being neglected under the Socialists, Hernu was at pains to point out that the measures he was proposing represented increased funding in the budget category '*études amont FNS/ANT*' since 1980.[37] The responsibility of the government to the defence of the nation through the FNS was proved by his figures that the general missile studies acounted for 1.2-1.3% of the *Titre V* equipment budget over the period 1981-85, as opposed to less than 1% during the final years of the Giscard d'Estaing presidency.

The example of the M-4 missile modernisation programme demonstrates not only how technology of existing systems can be called upon to change in response to changes in the strategic environment (in this case the fears that Soviet ABM measures mirroring SDI might weaken the credibility of the deterrent force), but also the long period of research and development required for such programmes. In an analysis of France's position vis-à-vis the new strategic environment, François Heisbourg, the former Deputy Managing Director of *Thomson International*, former *Conseiller technique* in the Defence Minister's *cabinet* (1981-84), and the then director of the Institute for International Strategic Studies in London, pointed out that under present circumstances *'la sagesse militaire et financière pourrait consister à ne pas aller trop vite dans le gel des spécifications du système choisi'*,[38] given that a period of twelve years research and development intervened between Pompidou's decision to go ahead with the initial M-4 system and its entry into service. There is a consequent need either for visionary planning or for a flexible definition of priorities to include all potential

future requirements. Four years after its entry into service, the continued modernisation of the M-4 was complicated by arms reduction negotiations concerning intermediate range weapons in Europe, notably a Soviet proposition to link SS20 withdrawal to a freeze on French and British missile modernisation. Despite the need to take decisions early for the defence of France in the next century, the fluidity of the strategic environment engendered a stricture of less haste and more speed.

Below, we examine the ground-launched missile programmes.

10.4.2. The *Sol-sol balistique stratégique* (SSBS) programmes

SSBS Missiles

	S2	S3	S3D	S4/S45
Commission	1971/72	1980-82	1984-85	Funding of programme ended 1992
Range	3,000 km	+3,500 km	+3,000 km	10,000 km ?
Warhead	Single. Thermo-nuclear. 150 kT	Single. Thermo-nuclear. 1 MT	Single. Thermo-nuclear. 1 MT	?
Hardened	N	N	Y	Y
Stages		2	2	
Height	?	?	13.7 m	10 m
Diameter	?	?	1.5 m	1.5 m
Weight	?	?	25.7 t.	9 t.

(Sources: various)

As the table indicates, ground-based ballistic missiles are only at their second generation, compared with the four generations of their submarine-borne equivalents, (M-1, M-2, M-20, and M-4). The S-2 missile which entered service in 1971 was replaced in 1980 by the S-3 system which is still in operation. A development programmme for an S-4 missile due to come into service in 1996 was frozen by Defence Minister Chevènement in the 1989 Defence budget Bill.[39] Taken initially in September 1988, this decision was confirmed in spring 1989 during the revision of funding for the 1987-1991 *loi de programmation*. Chevènement chose the term *"étalement"* (or deferment) to describe the future of the programme, stating that the realisation of the missile system no longer apppeared as necessary to the French defence effort. In addition, the financial

considerations imposed by the cost overruns of the *Triomphant* (probably the real reason behind the change of policy) made the S-4 programme less attractive.

The future of the S-4 programme had been the subject of much discussion during the 1980s. The major issue of disagreement over the replacement for the S-3 system was whether it should be fixed in silos or *mobile*. During 1987, debate about the suitability of a mobile ground-to-ground missile, the SX (nicknamed the *"missile à roulettes"*) led to a divergence of views between the Elysée on the one hand (the President's office) and Matignon (the Prime minister's office) and the Defence Ministry on the other. President Mitterrand preferred the option of replacing the S-3 missiles with S-4s in renovated silos, whereas MM. Chirac and André Giraud favoured both fixed and mobile missiles with a degree of technical compatibility between the new strategic system and the *Hadès* tactical missiles then under development.[40] Apart from political manoeuvering under the *Cohabitation* or power-sharing period between 1986-88, this dispute represented the two imperatives acting on the defence establishment at the time, namely the necessity of restricting costs and the need to respond to the new strategic environment.[41] Moreover, as the respected defence commentator Jacques Isnard suggested in *Le Monde*, the search for a degree of technical compatibility between *Hadès* and the S-3 replacement risked triggering debate about the evolution of French nuclear doctrine in the face of new European security requirements.[42] The notion of replacing the *Plateau d'Albion* and its symbolic and strategic characteristics (an attack on the Plateau is a "declaratory" strike) with mobile quasi-tactical missiles caused a certain disturbance within the military establishment.[43] The main conclusion that can be drawn from the debate is that the Presidential understanding of the mechanics of deterrence remains firmly strategic and spatial, a viewpoint reinforced by the judgement of the *Commission sur les Armes spatiales* that the modernisation in hand of French missiles guarantees the credibility of the FNS until 2010.[44] Mitterrand has of course further declared in another context his belief that *'la stratégie sera nécessairement spatiale dans le courant du XXIième siècle'.*[45]

In the following section of the chapter we shall examine the industrial aspects of these military applications programmes.

10.5. Theory and practice in perspective

Under the overall authority of the DEN, the study and industrial production of missiles are conducted by a small number of firms in the space sector, be they nationalised, para-public or private. The exception to this general rule is of course the warheads, which are designed and produced by the *Commissariat à l'Energie atomique* (CEA).[46] At this particular juncture we will restrict our analysis to the patterns of interaction between the STEN-DEN-DGA and their industrial partners, leaving consideration of the commercial importance of the transactions to the Section on the relationships between the State and the civil space sector.

Missile production involves a number of specialised technologies of which nuclear warhead development is the most striking and the least representative. Unlike the production of nuclear warheads by the CEA, the other techniques required in ballistic missile production, although similarly specialised, have immediate applications in other, civil fields of industrial activity. If we consider the ballistic missile in terms of its components, it becomes evident that there is a degree of (involuntary or accidental) "commonality" between this materiél and that required for civil applications. Thus if the warheads must be considered as specifically military in nature and application (despite the spin-off in terms of industrial techniques originated during their development), the re-entry body for example, (developed by *Aérospatiale*) integrates technology (such as heat shielding) of general applicability throughout the aerospace sector. Similarly, we have already discussed the relative interoperability of civil and military rocket propulsion systems, but another interesting example of this phenomenon is afforded by the inertial guidance system of the M-4 missile, which is not dissimilar to that of the Airbus.

In terms of industrial organisation, taking the M-4 missile programme as a case study, the industrial prime contractorship for missile production along with the control and launch systems is delegated by the DEN to the *Division Systèmes stratégiques et spatiaux* of *Aérospatiale*.[47] The propulsion system is produced by the *Société européenne de Propulsion* (SEP), and the *Société nationale des Poudres et Explosifs* (SNPE) who are associates in the G2P *Groupement d'Intérêt Economique* (GIE). As prime-contractor, Aérospatiale subcontracts certain components to smaller companies, either private (such as MATRA) or DGA-dependent facilities such as those of the DCAN/DCN at Toulon. For the S-3 SSBS system the pattern of interaction is even more streamlined with the entirety of the programme, the motors (SEP/SNPE) and the electronics excepted (principally *Thomson CSF* and *CIT Alcatel*), being managed by *Aérospatiale*.

This analysis of the ballistic missiles projects has aimed to illustrate a number of features of French military space policy. Firstly, it has attempted to illustrate the "para-nuclear" dimensions of new space activities in the military sector, dimensions which for all their historical, present and future importance are seemingly too often obscured by problems of definition or classification. Secondly, the content and extent of the ballistic missile programmes have been considered, along with an indication of their importance in the military and political imagination. Thirdly, the industrial ramifications of these programmes in terms of space sector organisation and technical cross-fertilisation between military applications and civil projects has been presented. All these features of the MSBS and SSBS programmes illustrate the especially direct link existing between the maintained credibility of the French deterrent through spatial modernisation and the military, technological and economic rank of France in the world.

10.5.1. *'Imbrication"*

The links between military and civil space activities have been described as *'imbrication'* or an interlocking of similar but not identical concerns and projects. The term of *imbrication* is in a sense the static equivalent of the dynamic synergy that linked military and civil activies are hoped to engender.

The extent of the synergy which is attained in joint civil-military programmes such as Syracuse and *Hélios* depends ultimately on the degree of 'commonality' between the two projects. In general, differences between civilian and military uses are a matter of degree rather than of nature. For *Hélios*/SPOT, the differences concern the quality of resolution of the optical equipment and the rapidity of access to the data gathered by the satellite. The problem of commonality is reduced by the fact that much of the difference between civil and military requirements lies in the treatment of the data, a distinction which allows separate processing techniques in the respective ground centres. As CNES officials have pointed out, the only strictly military space-related technique is probably the encoding of data transmissions to and from satellites in the interests of secrecy.[48] However, even this is not without applications in the civil domain in sensitive commercial operations, so the distinction between military and civil space is as difficult to draw on technical grounds as ever. Conversely, the closeness of the techniques required in the two sectors promises a good future for such cooperation. If asked to say whether SPOT and the *Télécom* satellites are military or civilian, the military authorities have a variety of answers available. The usual view expressed is that such programmes are purely civilian, with the military

elements merely riding piggy-back on civilian technology [49]. A more satisfactory explanation is that these programmes are the result of cooperation between civilian and military interests with the civil side preponderant in the payload of the satellites. The most honest, although still unsatisfactory explanation is that given the closeness of the links between civil and military technology and between the institutions and industrial entities which collaborate on the programmes, a distinction between the civil or military nature of the satellites is almost impossible to draw.

To take the example of SPOT/*Hélios*, military funding of the whole programme is estimated at some 30% of the total costs, with 50% of the costs of development of the joint platform coming from the Ministry of Defence.[50] At first sight this would seem to be a relatively equitable distribution of the financial burden. However, it should be pointed out that *Hélios*, due for operational use in 1993, represents a common technology and platform with the SPOT 4 generation of satellites. In this way, military participation in the early stages of the programme appears as an investment in the real sense of the term, except that once having funded the development of the first generation of SPOT, the advent of respecification for the satellite of real interest to the Ministry of Defence called for more funding yet. A number of different criteria can be invoked to determine the military or civil nature of a satellite programme, given the fact that the essential vocation, or actual application of the satellites is double. Technically, the payload weight of the civil and military components could be compared. Financially, the sources of funding and their volume could be confronted. Industrially, the research and development and production could be classified as military or civil based. Operationally, an index of 'weighted use' translating the exploitation of civil and military functions of the satellite could give a useful indication of the total exploitation made of the system and of the indispensability of its functions to defence, industry and society.

10.6. Conclusion

In conclusion to this chapter on the procurement of military space technology, it can be suggested that the fundamental feature of the practice of procurement is cooperation between the civil and military sectors. Indeed, the complexity of the synergy and imbrication of the industrial aspects of the programmes is such that it is notoriously difficult to draw the dividing line between 'military' and 'civil' space. The symbiotic relationship thus established between the two elements of the

sector is advantageous to the short-term interests of all, but the permanence of the solution of *coopération franco-française* is not without problems. During the late 1980s the military space programmes under development represented an intermediate stage of the evolution of French strategic thinking on space and industrial practices in the procurement of space systems.

Since the Gulf War, and France's realisation that the forces making up the Desert Storm coalition were almost totally dependent on American intelligence, especially satellite reconnaissance information, steps have been taken within the French defence community to redress this dependency and to thus restore France's autonomy of interpretation and action during such crises. Space does seem to hold a protected place within the defence budget as we have illustrated in our consideration of the lessons drawn by France from the Gulf war. Despite the problems of the civil space sector, confronted with sceptical oversight reports, the French military space programmes *Syracuse* (telecommunications) and *Hélios* (observation) are continuing, with the addition of extra satellites and the initiation of new programmes for the expansion of the spatial element of France's defence system. Post-Gulf war the program has been extended to cover two operational *Hélios -1* satellites, to be put into orbit in 1994 and 1996, and two *Hélios-2* satellites for 2002. The third generation observation satellite *Songe* is planned for 2008-10. *Osiris* (radar) and *Zénon* (listening) have also been included in the PPSM and in the military program law. The *Osiris* program is budgeted at 10 bn F and depends on Italian and Spanish collaboration, as well as on the potential participation of the Germans who have consistently stated an interest in a radar satellite. *Zénon* is a national program, whose preliminary stages are costed at 3 bn F, but whose development will be assured by the same industrial partners of the DGA and CNES.

Developments since the Gulf war have been such that optimism concerning European military space collaboration seems better founded: the continued Spanish and Italian participation in Hélios, taken as a sign of new dynamism and enthusiasm has given confidence to supporters of Euro-collaboration, although the previous 'inevitability' of German involvement in anything major has been eroded by the financial burdens of unification. There is even hope that the UK might find common ground with continental rather than Atlantic partners for the development of future generations of military telecommunications satellites.[51] In another forum, the French-backed WEU initiatives in favour of a European arms-reduction verification satellite based potentially on the French Spot or *Hélios* systems has also concentrated thinking on the practicalities of military cooperation in space matters.

Notes to Chapter 10.

1 Sapolsky, H. M., Science, Technology and Military policy, p.452, in Spiegel-Rösing and de Solla Price (eds), Science, Technology and Society, Sage, 1977, pp.443-471.

2 A conclusion derived by Sapolsky from the non-cancellation of weapons systems even in the face of inadequacy or undesirability. Sapolsky, Op. cit., p.453. It is interesting to note that in 1993 it was revealed that the 1992 cancellation of the Hadès tactical missile programme was 'ignored' by the army and the firms involved until the missile was sufficiently developed to be eventually 're-activated' if necessary. See Isnard, Jacques, La France a maintenu une "veille" opérationnelle sur le missile nucléaire Hadès, Le Monde, 11 February 1993, p.10.

3 Kaldor, for example, studying the cost of British defence in 1979 concluded that the position of defence firms in the economy is so precarious that they protect themselves against periods of inactivity by encouraging technological change and innovation, thus contributing to the changes in strategy their products are intended to counter. Kaldor, M., Defence costs and the Defence Industry, pp.281-314, in Kaldor, Smith, and Vines (eds), Democratic Socialism and the cost of Defence, Report and papers of the Labour party Defence study group, (Croom Helm, 1979).

4 De Rose, François, La France et la Défense de l'Europe, Le Seuil. 1976, p.84.

5 See Dictionnaire Larousse de la Défense et des Forces armées : les hommes, les moyens, les missions,Larousse, 1988, article on 'Programme majeur', pp.247-248.

6 Such programme directors are often relatively subordinate officers the success of whose careers is dependent to a large extent on the 'successful' completion of their programme - there is thus a built-in encouragement of programme continuation even in the face of difficulties.

7 Interview with Alain Simon, *Conseiller pour les Affaires militaires au CNES*, 9 February 1989.

8 Réseau Intégré de Transmissions Automatisées.

9 Pichoud, Daniel, Défense et espace Défense Nationale (January 1984), pp.127-140, p.138.

10 The ground stations for SYRACUSE I number twenty-six in total, and are of three different types: 3 fixed stations (Brest, Paris and *France-Sud*); 9 mobile ground stations; 3 light mobile ground stations and 11 ship-based stations. The equipment for these stations was delivered over the period mid 1985-end 1987. For greater technical detail, see Ghislain du Chêne, *'Syracuse II'* L'Armement, No. 11 *nouvelle série*, Ministère de la Défense, 1988.

11 The ground segment of the system will integrate existing SYRACUSE I stations, some of them up-rated to reply to the new capabilities of the system, additional uprated stations and additional new SYRACUSE II stations as well as a central control station for the network managing the flow of communications and ensuring liaisons with other military networks.

12 Interview, EMA, 19 April 1989.

13 Interview with ICA Daniel Pichoud, *Délégation générale à l'armement*, 2 March 1989. Pichoud maintains that the project could have been launched as a programme in 1982.

14 ICA Jean Sandeau, DEN, speaking at the ENA conference 'L'Espace; un Défi pour la France', L'Espace: un Défi pour la France, les Actes du Colloque, Association des anciens élèves de l'ENA, 1986, p.136.

15 Ruehl, Op. cit.

16 Chilton, P. 'French Nuclear Weapons', in Howorth, J., and Chilton, P., (eds), Defence and Dissent in Contemporary France, Croom Helm, 1984, pp.135-172, p.160.

17 Le Monde, 4 June 1983.

18 *'Helios:'* Greek for the Sun, mythologically he who sees and knows everything, whose rays pierce the darkness.

19 Interview, DGA, 2 March 1989.

20 Interview, EMA, 19 April 1989.

21 Hernu, Charles, IHEDN, 21 May 1985, Défense Nationale (July 1985), pp.5-14.

22 Isabelle Renouard, *Directeur adjoint des Affaires politiques* au *Ministère de la Défense*, speaking at the ENA conference 'L'Espace; un Dfi pour la France', L'Espace: un Défi pour la France, les Actes du Colloque, Association des anciens élèves de l'ENA, 1986, pp.132-134.

23 *'il n'est pas nécessaire, ni indispensable, que nous soyons capables de tout voir et à tout moment puisque nous avons quand même des accords avec nos alliés' mais à partir du moment où nous avons la capacité de vérifier certains éléments des informations qui nous sont données, cela oblige nos*

*alliés, ou même nos adversaires potentiels, à nous donner de l'information exacte.*General Fricaud-Chagnaud, speaking at the ENA conference, L'Espace: un Défi pour la France, les Actes du Colloque, Association des anciens élèves de l'ENA, 1986, p.135.

24 The choice of the French governement to back the French aerospace giant Dassault and its Rafale project, rather than to contribute to the European Fighter Aircraft is an example of this kind of problem

25 La Lettre du CNES, (Département des Publications, CNES, April 1987),p.4.

26 Interviews, D. Pichoud, DGA (2 March 1989) and A. Simon CNES, (9 February 1989), and Information Sheet No. 5 , Hélios, Satellite militaire d'observation,(Ministère de la Défense/DGA-DEN-STEN,June 1987).

27 Post-Gulf War of course there are grounds to suspect that the stand-alone doctrine of French defence may undergo some modification, leading to increased possibiities of European cooperation in space defence.

28 Dictionnaire Larousse de la Défense et des Forces armées : les hommes, les moyens, les missions, Larousse, 1988, p.211.

29 See for example IGA Bousquet, *Cours supérieur interarmés*, Les perspectives d'utilisation militaire de l'espace, 22 January 1988, (*Ministère de la Défense*/DGA-DEN, 26 January 1988) or Admiral A. Coatanéa, L'Espace militaire. Pourquoi ?, L'Aéronautique et l'Astronautique (1989-3-4, Nos 136-137),pp.45-47.

30 Jacques Ellul, Le Bluff technologique, Hachette, 1988.

31 Le Monde, 19 July 1989.

32 Direction des Engins (Ministère de la Défense/DGA-DEN, 1989), p.18.

33 The SX missiles intended as a replacement for the S-3 were to lorry-mounted and thus *'à déploiement aléatoire'*.

34 Hernu, Charles Défendre la Paix, Jean-Claude Lattès, 1985, p.46.

35 Op. cit., p.46.

36 To give the physical context of such work, the M-4 missile to which the new improved TN-71 warheads will be added is a three stage 11.05m rocket 1.93m in diameter and weighing 36 tonnes; in its present version it carries six 150Kt over a range of 4000Km. SeeRapport fait au nom de la Commission de la Défense nationale et des forces armées sur le projet de loi de programmation No. 733 relatif à l'équipement militaire pour les années 1990-93, rapporteur J-M. Boucheron, (Assemblée Nationale, 2 October 1989), Rapport No.897, pp.415-419.

37 Hernu, Op. cit., p.47.

38 Heisbourg, François, La France face aux nouvelles données stratégiques' Défense Nationale (April 1986), pp35-42, p.39.

39 Rapport sur la Loi de programmation militaire 1987-1991, No.622 (2 April 1987), Rapporteur François Fillon. Also commented in Le Monde 24 September 1988.

40 Rapport sur la Loi de programmation militaire 1990-1993, No. 897 (2 October 1989), Rapporteur J-M. Boucheron.

41 It also reflected contradictory industrial lobbying. Post 1991 and the Iraqi use of mobile Scud launchers their may be a return to support for the *'missile à roulettes'*.

42 Isnard, J., Le Monde 4 December 1987.

43 This suggestion was made by Jacques Chirac at a Presidential elections Press conference on 8 March 1988. Reported in Le Monde 10 March 1988.

44 Commission d'études sur les armes spatiales. Rapport de synthèse présenté au Ministre de la Défense, 30 January 1986, p.3.

45 F. Mitterrand, *l'Ile longue* 25 May 1985, Service de presse de la Présidence de la République.

46 Design, study, production and maintenance of nuclear weapons is the responsibility of the *Direction des applications militaires* (DAM) of the CEA.

47 *Aérospatiale* or SNIAS was formed out of SEREB, which was nationalized along with *Sud-Aviation* and *Nord-Aviation* in 1970.

48 Interview, CNES, February 1989.

49 Interview, *Contrôleur Général de l'Armement* Bruno Petit, *Ministère de la Défense*, 14 December 1988.

50 Interview, D. Pichoud, DGA, 2 March 1989.

51 The creation of the Eurodynamics company by Thomson-CSF and British Aerospace in February 1990 to merge their expertise in the field of tactical missile technology has showed that this kind of collaboration is effectively possible.

11. Evaluation

In this concluding evaluatory chapter we will bring together the various strands of our analysis of the different actors in the French space effort and of their different inputs to the making of policy. The analysis thus far has been restricted essentially to the period 1979-1992, but here, in order to place the developments of the 1980s in the context of the present and the near future, we shall include some consideration of the way in which French space is evolving now, and where it may go in the course of the 1990s.

Bearing in mind the multi-disciplinary framework for our analysis that was established in the Introduction, the present 'evaluation' of the making of French space policy examines the ways in which developments in civil space during the 1980s and early 1990s icontribute to an understanding of French state-agency relations in a high-technology sector and considers the extent to which the evolution of military space activities has shown the making of space policy generally to reflect traditional French concerns of 'independence' and 'prestige'. The evaluation also considers the ways in which the most recent developments in the organisation of French civil and military space activities are tending towards the making of 'integrated' space policy on the national level.

The discussion of the analysis here will follow the structure of the thesis thus far, in that it will firstly address the civil inputs to the making of policy (represented by CNES's activities and its relationship with government), and then will secondly examine the implications of the expanding military interest in space. In the third and final part of the chapter we will combine our conclusions on civil and military policy making in order to discuss how the French space effort overall is developing, to consider what lessons can be drawn from the experiences of the space sector in the 1980s and early 1990s, and to see what questions might be addressed by further research.

The chapter will thus have the following structure :

- **11.1.** Civil space policy : a troubled age of majority ?
- **11.2**. Military space in a changing environment
- **11.3.** Whither French space policy ?
- **11.4.** Concluding remarks

11.1. Civil space : a troubled age of majority ?

In evaluating developments in the civil sector of French space activities during the 1980s and early 1990s we must consider again a number of features of the civil space agency's interaction with government which have been presented in Chapters Five, Six and Seven. Essentially, these features concern the rôle and activities of CNES, and the nature of the *tutelle* exercised by government over the agency.

Concerning the rôle and activities of CNES, it has been seen that CNES is theoretically a mission-agency set up by the state in order to stimulate and manage the development of the space sector, and that in fulfilling these objectives, CNES has become involved in a considerable variety of responsibilities. These responsibilities range from encouraging the development of space science research in French laboratories, through managing the production in industry of applications programmes, to the creation of subsidiary companies and economic groupings intended to catalyse the French space-related economy (and provide income for the agency).

In order to undertake the range of activities through which CNES fulfills its mission, it requested and obtained constantly rising funding throughout the period of the 1980s and early 1990s. It is the financial 'burden' of CNES on the government funding budget for science and technology that increasingly drew the need for reform of the agency's *tutelle* to the attention of government. Conversely, the increasing volume of the agency's 'own resources' deriving from its industrial and commercial activities underlined for the state the fact that CNES was also in a position to exercise a measure of autonomy, both financial and political, and thus to manipulate the exercise of *tutelle*.

Concerning the nature of the tutelle exercised by government over the space agency, we have seen how the relationships between ministries and CNES were multiple and confused during most of the 1980s, until attempts to simplify the interface between the state and the EPIC were initiated in 1988/89 under the Rocard government. Until 1988 and the creation of a 'Space Ministry' in the form of the MPTE which began (with the Ministry of Research and Technology) to concentrate *tutelle*, responsibility for CNES was usually split between a number of ministries, none of which would have the explicit primary responsibility for the agency, thus creating a situation in which CNES as the leader of its sector, and unquestioned expert on space policy could exploit the divided and 'generalist' ministries who were theoretically its masters. Examples of CNES's ability to lead its tutellary authorities have included its use of the European dimension of its

activities as a lever on the state for continued high levels of funding in general (over-commitment of France to European programmes in the mid 1980s such as the Ariane V, Columbus and Hermès package), a casual approach to the transparency and accountability of decision-making (typified by the absence of any official note of France's decision to engage upon the development of Hermès) and by the irregular implementation of proper financial accounting procedures.

11.1.1 State-agency relations : CNES and government 1979-1992

The decisions taken by the 1979 *Conseil restreint* to create Arianespace and to engage in the the 'commercialisation' of space products and services marked the entry of the space sector into the first mature phase of its development, after the hesitant beginnings of the 1940s and 1950s, the rapid progress of structures and industry in the 1960s and the consolidation of the 1970s.

The idea propagated by the space lobby that the space industry would expand to become a substantial source of wealth and an indispensable catalyst of France's scientific, technological and economic development has not been confirmed by the evolution of the sector during the 1980s, although space as part of the aerospace and defence industries is a not insignificant contributor to turnover, employment and profits. The space sector does however represent a quite sizeable part of the state's funding for science and technology

The 1980s and early 1990s have indeed been the mature period of the space sector, but not in the 'commercial' dimension that was hoped for. It has been in the 1980s and early 1990s that CNES has evolved towards its finished form as a contemporary semi-autonomous mission agency maintaining links with government appropriate to the current ideologies of science, public policy and the 'modern' state. This evolution towards maturity for CNES has been the result of both the intrinsic nature of the space sector in its mature phase (for example the greater importance of industrial development activities rather than research) and the problems encountered by CNES and government during the 1980s (such as rising costs) which led them to reassess their relationship. In effect, the maturity of CNES's statutes in the early- and mid-1980s and subsequent reforms of the agency's relationship with government in the late 1980s and early 1990s have been complicated by changes occurring during the period in the fields of politics, strategy and diplomacy, economics, and the modernisation of the state.

In French politics, changes such as the transition from 23 years of right-wing rule to the Socialist administration of François Mitterrand in 1981, followed by the uncertainties of the two periods of political cohabitation between left and right

in 1986-88 and from 1993 created a context in which thinking on science and industry policies has fluctuated. These two periods of '*Changement*' and '*Cohabitation*' were perhaps somewhat unsettling in terms of the relationship between the political authorities and the scientific-technological community. In terms of party political ideology on science and technology for example, the two periods were placed under opposite signs as far as research policy was concerned: the Socialist ambition in 1981 was to renovate the whole edifice of French science and technology from the regions to the highest national level, and was inspired by an interventionist belief in the power of government to direct science and technology in favour of national objectives, whereas the period of *cohabitation* in contrast was characterised by the 'liberal' trends of the RPR/UDF in terms of industry, science, technology and the economy, which resulted in a less direct interaction between government and the development of science and technology policy and proclaimed reliance on market forces and deregulation.[1] It can be suggested that periods of relative political instability or transition such as those of the installation of the first Mitterrand administration and *Cohabitation* benefit organisations like CNES because their own continuity and maintained expertise contrast with the flux and uncertainty of their political masters. This 'ratchet effect' working in favour of CNES ambitions applied in 1981 and in 1986, emphasising to government the fact that CNES was increasingly in need of new structures of *tutelle*.[2]

Strategically and diplomatically, developments such as SDI, the demise of Communism and the Gulf War have created a troubled backdrop against which 'commercialisation' has struggled to succeed. Economically, the period has been marked by reversals of macroeconomic policy such as that effected by the Socialists in 1983-84, by changes of emphasis on the importance of the rôle of the state such as that made by the Chirac government of 1986-88, and by recession. In terms of public administration, the development of the space sector in and towards its maturity has also been affected by the desire to modernise the state which found expression under the Rocard governments of 1988-91.

In the model provided by Dyson's ideas on the nature of the French state, the French space sector in the 1980s can be considered to have reached a stage in its development where the state, no longer concerned with nurturing the infant activities in 'heroic' mode, is concerned to apply 'statecraft' and 'brokerage' to reform its relationship with the space agency. As an EPIC, CNES was initially created as an élite, corporatist, semi-autonomous body entrusted by the state with the 'indirect provision' of space-related technologies and services to France through its leadership of a *grand programme*. As was mentioned in the Literature

review, Dyson warned in 1980 and 1986 that doubts were arising about the capacity of European states (and their semi-autonomous agencies) to cope with the complexities and competition characteristic of contemporary high-tech industries. The idea of 'commercialisation' arguably represented government's and CNES's solution to the difficulties of managing a technologically and industrially mature space sector through a hoped-for transition to market-driven industrial activities and a space agency less reliant on public funds because of increasing 'own resources' from the commercialisation of its expertise.

The agency and government were however caught in the 1980s and early 1990s in the cleft stick of insufficient commercialisation and continued high levels of state funding for CNES/ESA programmes such as Ariane V, Columbus and Hermès. Concern over the trends of funding and over the accountability of CNES led to a progressive questioning of the activities of CNES and the space sector, as evidenced by the *Académie des Sciences* Rapport sur la recherche et la politique spatiale dans les prochaines décennies, (March 1988) and the Rapport annuel 1991 du Conseil supérieur de la recherche et de la technologie (CSRT), which expressed the wish that French space policy be examined in order to assess its objectives.

Most importantly, the *Office parlementaire d'évaluation des choix scientifiques et technologiques* (OPECST) or parliamentary technology assessment office produced a relatively critical Rapport sur les Orientations de la politique spatiale française et européenne in December 1991 which was followed by another critical study by a recently created science and technology scrutiny body, the *Comité national d'évaluation de la recherche* (CNER) : Rapport sur le Programme spatial français, (10 September 1992). As Hogwood and Peters have suggested in their study of the 'pathology' of public policy, the intervention of such oversight organisations is a sign that 'something is amiss', and the sudden flurry of interest in reassessing French space policy in the late 1980s was clear evidence of perceived 'illness' in the relationship between the agency and government and of the need for the application of some form of 'statecraft'.[3]

In the light of this understanding of the problems of CNES and government during the 1980s, the Rocardian reforms of the *tutelle* of the agency from 1988 to 1991 and the various 'oversight reports' which reached worrying conclusions about the management of civil space can be seen to represent the state's Dysonian 'brokerage' activities in the sector. Apart from the multiplication of oversight reports, a concrete example of the state's desire to reassert its exercise of *tutelle* and contrôle over CNES was the 'cancellation' (or postponement, since some studies are still continuing) of the Hermès programme, the first high-profile calls for

which were voiced in the OPECST Rapport Loridant of December 1991, and eventual lack of political support for which led to its demise a year later. CNES and French industry lobbied intensively for Hermès in the early- and mid-1980s, considering the development of a 'space shuttle' capability to be the next step in technology (and 'independence') for French and European space, and also a means of maintaining activity in the space sector during the 1990s.

However, in addition to general recommendations that the space effort needed to be rationalised organisationally and financially, the Loridant report raised specific doubts over the justification for the manned *Hermès* space shuttle/plane. By stressing that the motivations for manned European space flight were exclusively political and prestige-based, the report contributed to the consolidation of cost-based criticisms of *Hermès* culminating in its (indefinite) postponement in November 1992. The criticisms of *Hermès* were arguably the most important part of the Report's conclusions, since by attacking the *Hermès* programme, upon whose continuation and success the future of the French space agency and French space sector as it had evolved in the 1980s was predicated, the OPECST effectively called for a re-assessment of the entire direction of the space programme.

Although the criticisms contained within the Loridant report were made public in December 1991, the influence of the space 'lobby' within France was, interestingly, sufficient for CNES and the MRE to be able to persuade the *Office parlementaire* to postpone its completion from June 1991 to December, thus delaying its publication until *after* the crucial November 1991 European Space Agency meeting of space ministers in Munich, which notably reviewed the progress of *Hermès*, thus gaining a year of grace for the programme. Initially considered as part of the ESA's long-term European space plan at the Rome ESA meeting of January 1985 and confirmed at the Hague ESA summit in November 1987 as part of the Ariane V / Columbus / Hermès package, the chequered career of the (Franco-) European space plane is arguably symbolic of the evolution of the French civil space sector during the 1980s from 'youthful optimism' to 'mature restraint'.

11.1.2. CNES and government since 1992

As we have seen, under the government of Edith Cresson in 1991 and 1992 the issue of the most appropriate *tutelle* for the space agency seemed to lose priority, as responsibility for space was lost within a ministry covering *Equipement, Transports, Logement and Espace*, and as government attention to high-

technology was rather focussed on attempts at the redemption of the French nuclear industry. Since 1992 however, the pattern of *tutelle* for CNES has evolved in ways which suggest that government is still prepared to to modify the interface between the space agency and the state in an attempt to improve the accountability of CNES, but that contradicting influences on the structure of *tutelle* are also still present, which may prevent the definition of the simplest and most efficient state-agency interface. The table below lists the changes of responsibility for CNES that occurred in 1992 and during 1993, both immediately before and after the change in government from the Socialists under Pierre Bérégovoy to the centre-right RPR/UDF coalition led by Prime Minister Edouard Balladur.

CNES Tutelle 1992 - 94

	Tutelle
April 1992 - February 1993	*Ministère de la Recherche et de l'Espace* (MRE)
February 1993 - April 1993	*Ministère de la Recherche et de l'Espace* (MRE) and *Ministère de la Défense*
April 1993 -	*Ministère de l'Industrie, des Postes et Télécommunications*, and *Ministère de la Défense*, and *Ministère de l'Enseignement supérieur et de la Recherche.*

In more detail, these changes had the following content and motivations.

The *Ministère de la Recherche et de l'Espace* (April 1992 - March 1993)

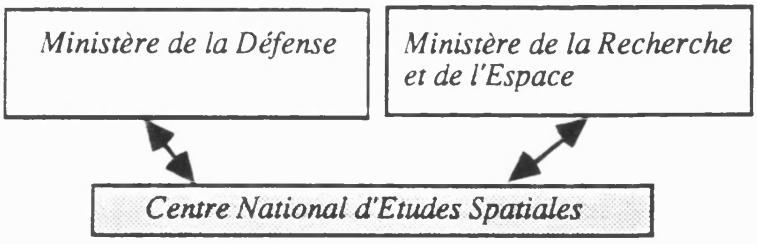
Under the new government of Pierre Bérégovoy, who replaced Edith Cresson in spring 1992, control over the space sector was once again centralised in a single ministry, this time combining the portfolios of Research and Space and inheriting the *Délégation générale à l'espace* in its organisational chart. The MRE under Hubert Curien as Minister thus continued the logic of the Rocardian MPTE (directed by Paul Quilès) in the sense that it merged what were seen as the naturally complementary briefs of space and research, but without the complications of the P.T.T., which had by then been resolved by the new statutes of *La Poste* and *France Télécom*. According to Curien, one of the major tasks of the new tutellary authority was to work on the creation of *'structures nationales fortes et transparentes'* in the field of space policy.[4] Such a desire to clarify further the relationship between the *Comité de l'Espace*, CNES and the DGE

reflected the enduring need for accountability and efficiency in the administration of the space sector.[5]

It is possible to see the MRE as the culmination of the Socialist ministerial management of the space sector, or if not as the 'culmination' of this strategy, at least as the final version of *tutelle* defined by the Socialists before their defeat in the Legislative elections of 1993. As an intermediate stage at least in the evolution of *tutelle* the MRE was undoubtedly an advance on the purely control-inspired reforms of the early Rocard period and the rationalisation-driven modifications of 1990 and 1991 (separation of space, posts and telecoms). In terms of personalities as well, Curien's eventual mastery of the research and space portfolios represented a logical responsibility for someone with his experience of science and technology in general, combined with his particular knowledge of space gained as President of CNES in the early 1980s.

Bérégovoy's period in office was troubled by various political-financial scandals and complicated by the long run-up to the Legislative elections of March 1993, when the Socialists were (eventually) ousted from government. One of the last decisions taken by the Bérégovoy government was to recreate a system of 'dual *tutelle*' for the space agency through the explicit involvement of Defence.

CNES dual *tutelle*



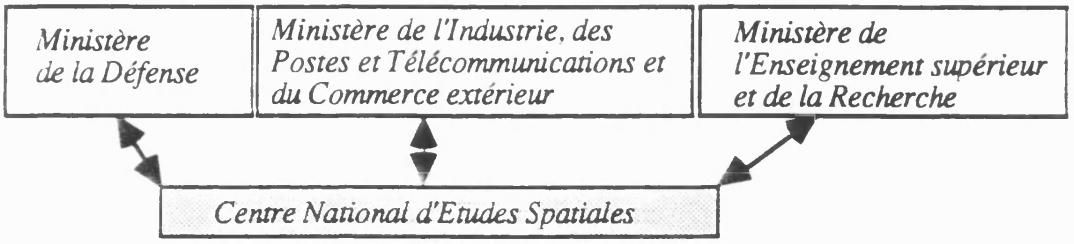
This late decision to extend the *tutelle* of CNES to include the Defence Ministry as well as the MRE was the effect of another influence on the organisation of ministerial authority for space, namely the increasing need for synergy and cost-efficiency in the space sector overall created by the rising military interest in space applications post-Gulf War. Dual *tutelle* was an important step towards what the new President of CNES, René Pellat (appointed in November 1992) has termed *'une politique spatiale intégrée'*.[6]

Balladurian *cohabitation* : triple *tutelle*

Another modification in the pattern of *tutelle* was effected by Edouard Balladur's redistribution of ministerial portfolios in April 1993. In addition to the double *tutelle*

recently instituted by Bérégovoy through the Defence Ministry, the new right-wing government reintroduced the Industry Ministry into the management of CNES, in echo of CNES's *tutelle* in the earlier period of cohabitation led by Chirac (and of earlier Socialist ambitions of conflating responsibility for space, research and industry in 'super-ministries' of Industry and Research). With the Industry portfolio were attached the responsibilities for Posts and Telecommunications and External trade, authority over this range of briefs being exercised by Gérard Longuet, whose ministerial experience of the 1986-88 *cohabitation* had begun with a gentle move towards the deregulation of some of *France Télécom*'s services.[7]

CNES triple *tutelle*



The creation of a system of triple *tutelle* has its logic, although in a sense it goes against the earlier Socialist attempts to simplify the structures of responsibility and accountability through the use of single tutellary ministries (soon complicated by Bérégovoy's dual *tutelle*). The logic reflected in Balladur's version of of the CNES-government interface is that space activities are essentially of industrial and commercial importance and are thus the responsibility of the Industry Ministry. Defence and research are also interested in space activities and are thus included in government's relationship with the space agency.[8] In terms of the administrative simplicity and efficiency of the pattern of *tutelle* however, the presence of *three* ministries as CNES's interlocutors in government may prove ultimately to favour the agency's exploitation of its expertise in negotiations with 'fragmented' political authority.

11.2. Military space in a changing environment

We must consider the development of military space activities during the 1980s and early 1990s in a number of aspects, specifically that of strategy and its implications for policy, technology and industry, that of the organisation of military space bodies in the military establishment and that of the industrial features of the production of space systems. Chapters Eight, Nine and Ten have examined

these aspects and have revealed how the making of French military space policy has been stimulated to develop intelligent strategic responses, well organised structures, carefully planned projects and efficiently produced systems.

In terms of strategy and strategic planning, SDI and the Gulf War provided considerable catalysts to French thinking on the military uses of space, leading to a situation in which, as we have seen, space surveillance and communications systems appear to be almost the new technological 'fetish' of the armed forces. France has attempted to manage strategic uncertainty over the need for spatial elements in her defence and to use new developments in strategy and technology in her favour by such means as suggesting that ASAT measures might provide a means of shifting deterrence into space or the notion of profiting from 'discontinuities' in strategy and technology as was done in the 1960s with the nuclear deterrent.

In terms of the organisation of military space, the French defence community based around the Defence Ministry, *Etat-Major des armées* and the *Délégation Générale pour l'armement* has evolved a network of planning and decision-making bodies whose position in the military-political hierarchies ensure that military space policy is supported by the highest levels of military and political influence. Not only does the organisational chain of responsibility tend to protect military space, the actual functioning of military space planning is intended to insulate programmes from re-appraisal, for example through the mechanism of the pluri-annual Plan de programmation spatial militaire (PPSM). The organisation of military space bodies also involves cooperation with civilians involved in civil aspects of France's overall space effort from which military space can profit, and this cooperation has been structured in such a way as to guarantee that military specifications and requirements are met, for example through the *'officiers de programme'* and various coordinating bodies.

In terms of the industrial production of space systems, there has been developed what has been called *'coopération franco-française'*, or *'imbrication'*, under which dual-use technologies such as satellite observation and satellite communications have given rise to collaborative military-civil programmes such as Syracuse and Hélios, and there have been moves to obtain European collaboration on projects which are essentially of interest to the French but where the high costs to be borne indicate the need for contributions from partners who will also derive some benefit from the programme.

11.2.1. Strategic uncertainties and national symbiosis 1979-1992 ?

The making of military space policy has traditionally derived most crucially from France's need to guarantee the credibility of her nuclear deterrent. As we have seen, the French military establishment has evolved sophisticated structures for defining policy and for implementing programme development. As the technological complexity of deterrence has increased, and as new requirements in space technologies have arisen (Chad, the Gulf War), a military space capability has become more and more an unavoidable necessity for France both in terms of security policy credibility and in terms of prestige, or ('grandeur'), but increasingly, doubts have arisen over the best way for France to achieve such a capability.

Admiral Pierre Lacoste remarked in 1989 that from the point of view of the superpowers, the French distinction between civil and military space must appear something of a paradox, given the degree of integration of their civil and military efforts in the quest for prestige.[9] The present symbiotic relationship between the two sectors in France seems to be relatively successful, to the extent that military programmes are being efficiently conducted in tandem with civil industry and exchanges of expertise and facilities occur without excessive hindrance. Official views on collaboration remain resolutely positive in terms of its results, stressing the (perhaps debatable) claim that DGA industrial activities in space programmes and in general stimulate the turnover and competitiveness of French industry: *'Les retombées de technologies militaires sur les programmes spatiaux civils, ainsi que sur de nombreux secteurs de la vie courante... sont autant de témoignages de l'impact des programmes spatiaux militaires sur l'activité et la compétitivité de l'industrie nationale'*.[10]

Synergy as an imperfect and temporary solution

However, one must not lose sight of the fact that the search for national synergy and '*imbrication*' is the solution, necessarily imperfect because of the eventual costs of military space systems, to the problem of realising the successful long-term spatial modernisation of the armed forces. This challenge has coincided with other difficulties, one specific to the space industry and the other concerning French industry and society as a whole. As predicted by Hubert Curien in 1980, the space industry in the decade of its 'maturity' has been forced to evolve an adequate 'dialectic' between the promoters of new technologies and potential users, amongst these the military.[11] The difficulty facing industry and society is that of maintaining France's technological and industrial rank in the post-SDI, post-

Gulf War, post-Maastricht world. In effect, France is faced with the conundrum of maintaining an industrial potential based on the development of the nuclear deterrent and on its arms sales, in an economic context where purely national solutions to the production of defence systems are no longer financially feasible.

The system is still imperfect, relying (despite the reforms of 1985 and of 1991-93) on the evolution of an understanding of state-military-industrial relations inherited from the creation of the DGA and CNES in the early 1960s. Given the pace of technological and strategic change, *coopération franco-française* is merely a transitory phase between the national self-reliance of the 1960s and future collaboration on a European scale. Calls for European collaboration in military space have been numerous, and former *Délégué Général pour l'armement* Jacques Chevallier has expressed his faith in the absence of autarky and *'autosuffisance'* characterising military space.[12] The frequency of references to European military space cooperation in the face of previous failures in joint projects perhaps betrays the real fear that France may now indeed be 'too small a country'.[13]

Coopération franco-française or Euro-collaboration ?

The medium- and long-term future of French military space programmes, as opposed to the present situation represented by Syracuse and *Hélios* described above, involves a choice between autonomy and European collaboration. The present autonomy of French military space activities is diluted essentially only by the minor Italian and Spanish participation in *Hélios,* although it can be suggested that this form of burden sharing is a model for future more extensive partnerships. In fact, the second half of the PPSM for 1986-2002 reportedly relied already on collaboration within Europe.[14] In 1986, ICA Pichoud stated unambiguously that military space was ultimately a European affair, even if France were to play a catalysing rôle :*'L'enjeu que représente les activités spatiales pour la sécurité est, à terme, plus à l'échelle de l'Europe que de la France seule, même si celle-ci peut jouer un rôle moteur pour les engager. Les spécificités de l'espace, en termes de missions et de capacités industrielles, vont dans ce sens.'*.[15] This is a revealing expression of the cominant view in French military circles that European cooperation (if French-led) is unavoicable. As well as Pichoud, commentators such as Admiral Jean Chabaud of the SGDN, General Guy Fleury of the GES and Isabelle Renouard of the *Direction des Affaires politiques* of the Ministry of Defence also expressed in the late-1980s the hope or belief that the spatial defence of France and Europe might eventually be arrived at through European

cooperation in military space, in the same way that the ESA has succeeded in leading civil space collaboration since 1975.[16] The European solution is supported for two (complementary) reasons : cooperation is both necessary because of the costs involved, (Fleury quoted 8 billion francs as the average cost of a military space programme, which with a slight increase seems to be borne out by current estimates), and desirable because of the stimulus that such cooperation could give to European integration.

Europe as catalyst or constraint ?

Indeed, for Chabaud, who poses the question of whether SDI will be seen to have been a death blow or stimulus (*'un coup de grâce ou un coup de fouet'*) for European security, cooperation in military space is perhaps the last chance for Europe to overcome national differences and build a coherent defence system. Chabaud even draws a direct parallel between the strategic objective of the nuclear strike force in the late 1940s (and the decision to proceed with its development despite the imprecision of its definition) and the strategic objective of a European spatial defence.[17] From a more strictly European perspective, an anonymous group of senior civil servants in the Ministry of Defence, (writing under the pseudonym of CRITIAS) has stressed the common position occupied by all European countries, regardless of their possession of nuclear weapons, vis-à-vis threats to their security from superpower space militarisation.[18] On the technical level, there is a general air of bullishness concerning French and European capabilities of producing even the most sophisticated space hardware for military purposes, despite occasional partial dissenters such as Battistella, who has voiced the view that in the field of orbital photographic surveillance, France is at least thirty years behind the United States.[19]

For non-technical reasons however, other analysts have taken a more sanguine view of the possibility of European cooperation in military space, doubtless basing their scepticism on the failure of past attempts at common weapons development such as fighter planes and main battle tanks. A recent conclusion to this debate is Jérôme Paolini's conclusion that European military cooperation is dependent on, rather than a stimulus to, wider European integration :*'De par son manque d'autonomie par rapport au continuum des opération aéroterrestres, l'espace militaire en Europe apparaît comme une résultante plutôt qu'une véritable dynamique de l'intégration'*.[20] This contradiction of the hopes of many of the partisans of European integration is derived from the observation of the disparity of strategic positions assumed by different major European nations, particularly

Germany, who would be France's main partner in any common space defence programme, (we have already mentioned the apparent divergence of French and German technical specifications for a joint observation satellite).[21] Paolini's analysis rejects the argument proposed by CRITIAS, and recommends that France's rôle should be limited to the maintaining her position as prime-mover of European civil space as a means of preserving a capability of developing military applications in the future. In the medium term, such a rôle would imply the French national military space effort being limited by the normal constraints determining her defence policy at between 3.5 and 4.0% of the defence budget equipment heading (*'Titre V'*).

The pace of developments in this field is such that, since Paolini's study in 1987, optimism concerning European military space collaboration has become more robust in the late 1980s and early 1990s: the Italian participation in *Hélios*, taken as a sign of new dynamism and enthusiasm, and the 'inevitability' of German involvement in anything major give confidence to supporters of Euro-collaboration.[22] There is even hope that the UK might find common ground with Continental rather than Atlantic partners for the development of future generations of military telecommunications satellites.[23] Concretely, the idea mooted in September 1987 at the conference 'Défense nationale et coopération internationale' of the creation of a military EUREKA programme[24] resulted in a proposal made in June 1989 by the French Defence Minister Jean-Pierre Chevènement for increased cooperation in military research within the framework of the *Groupement européen indépendant de programme* (GEIP).[25] This renewal of interest in cooperation in military research coincided with the appointment as *Délégué Général pour l'armement* of Yves Sillard, a military engineer having served with CNES and as the General secretary of the French EUREKA secretariat. In another forum, the Western European Union (WEU) initiatives in favour of a European arms reduction verification satellite based potentially on the French SPOT or *Hélios* systems also concentrated thinking on the practicalities of military cooperation in space matters. In the 1990s the costs of reunification for Germany have undermined her readiness to fund both civil and military space, however, so cooperation is still less than an evident solution.

Despite these uncertainties about the long term viability of the current approach of the French state towards the military space industry, the fact cannot be avoided that underlying the whole edifice of military space planning as well as the civilian space industry is the feeling that space remains an essential sector of activity for France if she is to retain her place in the international system. A final quotation from the former President of the *Fondation des études pour la Défense*

nationale (FEDN), General Fricaud-Chagnaud, speaking in 1985, illustrates this point as well as evoking the notion of prestige or 'grandeur' that still colours all French space activities. In this perspective, French military presence in space is essential to her remaining a major power, just as in de Gaulle's time the development of nuclear capabilities fulfilled the same rôle : *'si, d'ici douze ou quinze ans nous ne sommes plus dans l'espace, et dans l'espace militaire, nous aurons signé notre déchéance, et nous aurons abandonné notre rang. Il faudra donc être dans l'espace, comme le Général de Gaulle a voulu que nous soyons nucléaires pour être une grande puissance. Le reste ne fait que suivre.*'[26]

Such an 'un-reconstructed' Gaullist approach, while underlining the *significance* of military space for France, perhaps also reflects an overly national understanding of its importance for properly harmonious European cooperation. The extension to the European level of French military space activities is likely to be the acid test for motivations within government and military establishments in support of space programmes since the 'Europeanisation' of French strategic defence and of sensitive defence-related high technologies may run counter to the previous trends of military attitudes towards European cooperation.[27] Put simply, can French security policy in general, and military space policy as part of overall French defence, become truly European ?

11.2.2. Military space since 1992

As we have seen, in 1991 and 1992, following calls for modernisation of the armed forces in general from past Defence Ministers such as Jean-Pierre Chevènement and Charles Hernu, the then Defence Minister Pierre Joxe was at pains to set out France's renewed committment to military space, in particular in a series of declarations which appeared to wish to draw the lessons of what has been described as 'the first space war'.[28] In February 1992 he stressed that space would be a prioritised item both in the 1992 budget and in the military program law for 1993-97, which was eventually approved in July 1992 by the Council of Ministers and contained new satellite equipment programs, in addition to the the existing Syracuse and Hélios telecommunications and observation satellites programs decided and initiated during the 1980s.

In November 1992 a classified internal Defence ministry report on the costs of the various equipment programmes was leaked to the press, revealing that over the period of application of the programme law spending on the nuclear forces was planned to *fall* by an average of 6.6% per year, whereas space funding was set to *rise* by an average 3% per annum. Although the conventional forces still

represent the great bulk of spending on equipment programmes, it was nevertheless patent through 1993 that the space communication and observation programmes were favoured in this funding plan to the detriment of conventional and especially nuclear projects. In contrast to the traditional funding preeminence of the nuclear aspects of French defence, these unambiguous reductions in investment in the FNS revealed the strength of the state's manifest desire to modernise the deterrent and conventional forces through the acquisition of a substantial spatial component to the defence system. This shift in funding priorities reflects one of the major conclusions drawn by the defence establishment from the Gulf war, namely that France needed desperately to enhance not her 'absolute autonomy' of the nuclear deterrent, but the more relative independence of intelligence gathering, communication and control in times of conventional conflict.

As we have seen, in February 1993, Prime Minister Pierre Bérégovoy announced that CNES would in future be in charge of military space programmes and would itself consequently be under the joint ministerial authority of the Defence ministry, as well as the *Ministère de la Recherche et de l'Espace.*[29] This decision reflected both a desire on the part of the state to recognise existing patterns of interaction within the overall space sector (namely the *coopération franco-française* of Syracuse and Hélios), and the ambitions of CNES to profit from the financial favours bestowed by government on the military space sector. In effect, the relative vitality of the military sector, (whose transfer to CNES is likely to represent an annual additional income of between 3.5 and 6 billion Francs by the end of the decade) has created tensions between the civil agency stricken by national economic rigour and by the cancellation or ESA management of major programmes and the *Délégation Générale à l'Armement,* the traditional guardian of the military space effort.

Developments during 1992 and 1993 were complicated by the impending Parliamentary elections of March 1993 which threatened to create disturbances for the military space sector, even if the presumed effect of the likely Right-wing majority and consequent political 'cohabitation' between Socialist President and right-wing Prime minister was likely to be increased government interest in French armed forces, as was the case in the 1986-88 cohabitation which precipitated France's military space modernisation. In fact, since 1993, military space has continued as a priority element of the reform of the armed forces intended to equip French defence for the years 2000 - 2010 which was developed in the 1994 'White paper' on defence.

In the following concluding section of this chapter we examine the features of French politics and of the French space effort itself which imply that the making of space policy will still be required to evolve before it finds a fully satisfactory form.

11.3. Whither French space policy ?

The context of French civil and military space activities is still far from stable, notwithstanding the efforts made to reform the *tutelle* of CNES and the apparent success of the current military space programmes. In addition to ongoing developments in the structures and pattern of *tutelle*, the instability of the context derives in the civil sector from a developing debate on science policy, and in the military sector from continuing uncertainty over France's defence choices and the availability of funds to finance them. As a further complicating factor, the difficulties of cohabitation since March 1993 are likely to end in spring 1995 with changes of government and President, which, whatever the political colour of the respective incumbents of Matignon and the Elysée, are likely to disrupt any decisions made in the interim period of Mitterrand's *fin de règne*. The two major general domestic factors which will influence the future of French space policy are the debate over research and the debate over defence.

11.3.1. The continuing debate over Research

Under François Fillon as Minister for Higher education and Research the place of science in French society has once again become an issue of some importance, and implicitly therefore, France's commitment to space is also being reappraised.[30] The arrival of the centre-right government in power has effectively given rise to an operation of appraisal for the science and research policies conducted by the Socialists.[31] Such an 'evaluation' aims as much at criticising past practices as at establishing new bases for the development of French science and technology, and much of the debate has concentrated on the claimed 'irregularities' of funding for research during the period 1981-1993, when *'l'enfant chéri de la République'* (as science has been called by Mitterrand), although apparently favoured with increasing long-term funding was actually squeezed by increasingly restrictive annual grants from government.[32]

Although Fillon has launched a 'national consultation' on the objectives and organisation of French research, the debate on science is thus still centred essentially on the costs of the government funding for research as they are

perceived by a Finance and Budget Ministry and government concerned as ever to limit spending.[33] Within such a context of financial rigour and uncertainty over the future direction of science and technology, CNES seems to be maintaining its priority position[34], but is nevertheless becoming increasingly exposed as one of the largest beneficiaries (nearing 20%) of the *Budget civil de recherche et de développement.*

11.3.2. The continuing debate over Defence

In defence policy, controversies are still current concerning the strategic choices open to France and the requirements in *matériel* and funding necessary to fulfill France's military responsibilities. The run-up to the Presidential elections of April-May 1995 has already been marked by fevered discussions of the *Livre blanc sur la défense* and of the *Loi de programmation militaire 1995-2000*, which puts the principles of the *Livre blanc* into financial terms.[35] The *Livre blanc sur la défense* (or Defence White Paper) is only the second such document to have been produced in France. Following the model of the first White Paper prepared by Michel Debré as Defence Minister of Jacques Chaban-Delmas and President Pompidou, which was published in 1972, this second *Livre blanc* was made public in February 1994 by Prime Minister Edouard Balladur, who had requested its preparation in May 1993. Produced by a Commission of 25 members and written by a senior civil servant and an army general, the *Livre blanc* received no input from the Presidency, except in the last stages of its finalisation, but was submitted to the Defence Ministry for correction, in order to officialise its status as a governmental document of reference.[36] As the *Livre blanc de la défense 1994* makes clear in an introductory statement by Edouard Balladur, in setting out Gaullist French defence policy, the original White paper of 1972 marked the transition from France's traditional rôle of 'colonial defence' to the modern era, and by implication, the present restatement of defence choices marks an equally momentous turning point in French security policy, namely the move from dissuasion in the stable context of the Cold War to a defence stance appropriate to the modern international system and new technologies. Another implication may be drawn from this, namely that the turning point of France's move to *'une dissuasion nucléaro-spatiale'* might ultimately establish military space systems as the armed forces technology 'fetish' of the 2000s, just as nuclear weapons were the obsessional play-thing of French defence in the 1960s.

One of the major points put forward by Balladur and Defence Minister Léotard in their introductory statements, and reiterated at various junctures in the

Livre blanc is the necessity for French security policy to evolve towards integration in some form of European defence, but only in the longer-term. Moreover, in terms of the industrial production of weapons systems, the White paper distinguishes between defence technologies in which France must retain independent expertise (nuclear and nuclear-related, including ballistic missiles, launch and communications systems) which must be produced nationally, and other less strategically sensitive technologies in which national expertise must be maintained but where cooperation is permissible (surveillance, communications, data processing).[37] In the words of the *Livre blanc*, Europe is '*un impératif et une chance*' for defence policy and for the French defence industry, but, reading between the lines, only as long as France remains leader in the noblest technological fields.[38]

11.4. Concluding remarks

Above these issues of science funding and defence spending, which are in essence questions of finance, and therefore to a certain extent contingent on the vagaries of macroeconomic performance and budgetary ideology, and beyond the political issues of changes in the executive, the future making of French space policy and the content of that policy will be conditioned by the 'paradoxes' which characterise the French space effort as it currently stands. The paradoxes are that the traditionally *successful* civil side of space policy is increasingly in *difficulties*, on the domestic and European levels, whilst the hitherto low profile *national* military space sector is more and more tending to move towards successful high-profile *international* cooperation.

In civil space the national space agency CNES is in a state of turmoil because of government's moves to reform its relationship with its chosen manager of the space sector, these attempts at reform having been precipitated essentially by CNES's over-ambitious involvement in costly French-led European programmes such as Hermès and Ariane V. Thus the management of the *domestic* civil space sector is in crisis because of the French state's concern to (in Dyson's terminology) 're-establish a governing competence and to maintain governmental and ideological credibility', the perceived loss of authority over CNES having been caused by the agency's skilful but ultimately over-committed use of *international* collaboration.

In military space, the answers to France's defence needs are increasingly seen to lie in European collaborative projects, both industrially and strategically, and thus France's traditionally independent security stance is to be transformed

into a kind of collaborative defence involving the joint development of defence systems and increasing integration of strategy. On the domestic level, responsibility for French military space has been moved to lie with the civil agency CNES, which will conduct programmes in liaison with the DGA, which itself is under increasing criticism for its inefficient cost management of military equipment programmes in general.

The solutions to the problems caused by these paradoxes reside essentially in the degree to which the reforms of the CNES-state interface will eventually succeed, and in the practical success of collaborative industrial production of 'European' military space systems. Equally, in terms of national space activities, the success or failure of recent modifications to interaction between CNES and the DGA implemented by the Bérégovoy and Balladur governments' reform of CNES tutelle will be important in determining how the making of policy will evolve. On another level however, the future health of the French civil space sector also depends on the redefinition of cooperative European space activities, since it is the European dimension of CNES's activities which is likely to remain most difficult for French governments to revise satisfactorily. Similarly, the ultimate success of a 'Europeanised' French military space effort will be conditioned by the extent to which long- and deep-rooted traditions of national independence in the Armed Forces can be replaced with truly European sentiment.

Future research on French civil space activities will be able to address the issues of the resolution of CNES's crisis of identity, the continuing financial problems of the funding of the civil space effort in times of economic rigour, the future of the EPICs and *grands programmes* in an increasingly internationalised context of science and technology, and the success of the recent attempts by the European Commission to work with the ESA in a reform of European space policy.[39] In the field of defence, further research will continue the analysis of the links between developing strategy and the need for military space systems, appraise the evolution of the DGA and France's expensive arms industry, and assess how far France is really prepared to go down the road towards European security.

Sometimes described in the past by sceptics as *'une solution sans problème'*, it remains to be seen in the mid-1990s and beyond, whether the French space effort and the making of policy will avoid becoming *'un problème sans solution'*.

Notes to Chapter 11.

1 Although party rivalry over 'who is best for French science' is at times intense, the attitudes of left and right to research do share some common features (such as a belief in its importance). The difference in approach over space was however re-iterated in April 1993 with the system of triple *tutelle* under which CNES became dependent essentially on the Industry Ministry again.

2 This was the candid opinion of Jean Gruau, *Inspecteur Général au CNES.* Interview, 22 November 1989.

3 Hogwood, Brian W., and Peters, B. Guy, The Pathology of Public Policy Clarendon, Oxford, 1985, p.6.

4 See Augereau, Jean-François, L'espace français change de main., Le Monde, 15 April 1992, p.19.

5 One of the consequences of the change of tutelle to the MRE was in effect the sidelining of the DGE,whose *Délégué Général* left to take up other responsibilities, and whose activities were run down.

6 See Langereux, Pierre, Le CNES sera au coeur du programme spatial militaire français, Air et Cosmos, 23-29 November 1992, p.52.

7 The Socialists had moved away from the link between CNES and Industry, since practice had arguably shown them that this was not the best home for the tutelle of space; the right however, as the recent opposition, wer still driven a more 'ideological' approach to high-technology, which saw space as an industrial issue.

8 The return to what has been described as *'la logique industrielle et commerciale'* represents a reversal of Socialist thinking on space, which tended to consider it to be most closely related to 'research'. For a brief discussion of the change to triple tutelle, see Augereau, Jean-François, Le CNES sera placé sous la triple tutelle de MM. Longuet, Léotard et Fillon, Le Monde, 15 April 1993, p.8.

9 Lacoste, Admiral P., Que peut apporter l'espace militaire à l'Europe?, L'Aéronautique et l'Astronautique (1989-3-4, Nos 136-137), pp.48-51.

10 La DGA à Technospace, DGA Information brochure for the Bordeaux Technospace Trade Fair, 6-9 December 1988. It is worth noting that this commercial propaganda runs counter to the more usual official claim that the military sector is an adjunct of civil activities.

11 Curien, Hubert, La France dans l'Espace, Défense Nationale (May 1981), p.26.

12 Chevallier, Jacques, Discours d'ouverture, Activités spatiales militaires conference, Paris, October 1988, reproduced in L'Aéronautique et l'Astronautique (1989-3-4, Nos. 136-137), pp.43-44.

13 See IGA Jean Sandeau's contribution to the ENA Space conference; L'Espace: un Défi pour la France, p.151.

14 Interview, Lieutenant-Colonel Bouchard, PPE/EMA, 19 April 1989.

15 Pichoud, Daniel, L'espace pour voir, communiquer, écouter, Défense Nationale (July 1986), pp.141-152.

16 See their various contributions to the debate at the ENA conference reproduced in L'Espace, un Défi pour la France (Association des anciens élèves de l'ENA, 1986).

17 Chabaud, J., in L'Espace, un Défi pour la France , pp.103-104.

18 CRITIAS, 'Pour une capacité spatiale militaire de l'Europe', Le Monde 16 March 1985.

19 Battistella, J., in L'Espace, un Défi pour la France, pp.104-106.

20 Paolini, J., Politique spatiale militaire française et coopération européenne, Politique Etrangère (2/87), p.450.

21 Although France and Germany have collaborated on DBS satellite launching.

22 Interview, Lieutenant-Colonel Bouchard, PPE/EMA, April 1989.

23 The creation of the Eurodynamics company by Thomson-CSF and British Aerospace in February 1990 to merge their expertise in the field of tactical missile technology has showed that this kind of collaboration is effectively possible.

24 See Libération 23 June 1989, 'La France veut lancer un /eureka en kaki', p.13.

25 Independent European programme group.

26 Général Fricaud-Chagnaud, L'Espace, un Défi pour la France Association des anciens élèves de l'ENA, 1986, pp.134-136. (emphasis added). This quote encapsulates all elements of an almost totally unreconstructed Gaullist approach to Grandeur, referring as it does to 'decline' and the 'rank' of

France in the World as a 'great power'. The final implication that *'le reste ne fait que suivre'* implies that economics and finances are of little importance in such a situation, echoing de Gaulle's famous statement that *'l'intendance suivra'*...

27 Also, if one accepts the 'suspecting glance' approach of Admiral Sanguinetti, the 'Europeanisation' of the French space system may be the last chance for the cleaning up of the corporatist and anti-democratic features in the space MIC.

28 Thus during April and May 1991 he suggested that Europe as a whole should develop together a military space capability in order better to manage peace and to foresee the development of conflicts and that France would give military intelligence gathering the full status of a military arm within the organization of the armed forces, thus increasing its prestige in accord with its new space-derived importance. For a treatment of the Gulf War as the first 'space war', see Anson, Sir Peter and Cummings, Denis, The First Space War : the Contribution of satellites to the Gulf war, RUSI Journal, winter 1991, pp.45-53.

29 *Tutelle'*, or ministerial authority for CNES has followed a somewhat tortuous path over the lifetime of the national space agency. The supposedly civil brief of the agency did not prevent it from contributing to the development of the nuclear deterrent, coming initially under the responsibility of the Ministry of Scientific Research and Atomic and Space questions, which exercised authority for space matters until 1965. During the greater part of the1970s and 1980s authority for CNES was exercised in the various , Research, Technology and Industry ministries, making Bérégovoy's 1993 innovation all the more interesting.

30 Interestingly, and perhaps an indication of the importance of space, Fillon's *chef de cabinet* at Higher education and Research is Jérôme Paolini, specialist on space and author of the study on European military space integration referred to earlier.

31 See, for a brief overview of the research debate, Buchan, David, Strategic vision needs to be restored, Financial Times, 12 July 1994, p.VI., (special supplement on France)

32 The particular mechanism of this squeeze involved the distinction drawn between *'autorisations de programme'* and *'crédits de paiement'*. See for example Budget de pénurie pour la recherche, Le Monde, 13 October 1993, p.14., and Fillon, François, Préparer l'aveni', Le Monde, 17 November 1993, p.17.

33 7 billion francs of government spending overall were frozen in May 1994; see Vernholes, Alain, Des retombées parfois douloureuses, Le Monde, 9 June 1994, p.12.

34 See Hughes, Stella, French research's top ten, Times Higher, 1 July 1994, p.11. : space is designated as one of ten research areas deemed to be of 'national importance'.

35 For this reason we shall here concentrate on contents of the Livre blanc.

36 The 25 member commission of experts presided by Marceau Long was served by Jean-Claude Mallet (*Maître des requêtes au Conseil d'Etat*) and General Eric Pougin de La Maisonneuve, (*Secrétaire du Conseil de défense and Directeur de la Fondation d'études de défense*). See Le Monde, 25 February 1994, Le Livre blanc sur la défense, p.7.

37 Livre blanc, pp.117-118.

38 Livre blanc, p.120.

39 The European Commission has interested itself in space policy on the European level since at least 1988, and during the early 1990s has been increasingly active in calling for a new organisation of this relatively successful form of 'functional integration'. See for example Commission of the European Communities, The European Community and Space: A Coherent Approach, COM(88)417 final, July 1988, and Commission of the European Communities, The European Community and Space: Challenges, Opportunities and New Actions, COM(92)360 final, September 1992.

Glossary

ABM	Anti Ballistic Missile.
ANVAR	Agence Nationale pour la Valorisation de la Recherche.
ASAT	Anti Satellite.
ASE	Agence Spatiale Européenne.
BCRD	Budget Civil de Recherche et de Développement.
BMD	Ballistic Missile Defence.
BRGM	Bureau des Recherches Géologiques et Minières.
C3I	Command and Intelligence.
CAP	Centre d'Analyse et de Prévision.
CASD	Comité d'Actions Scientifiques de Défense.
CASDN	Comité d'Actions Scientifiques de Défense Nationale.
CCRST	Comité Consultatif de la Recherche Scientifique et Technique.
CEA	Commissariat à l'Energie Atomique.
CELAR	Centre d'Electronique de l'Armement.
CEMA	Chef d'Etat-Major des Armées.
CERES	Centre d'Enseignement et de Recherches Socialistes.
CERIS	Centre européen de relations internationales et de stratégie.
CERN	Centre Européen de Recherches Nucléaires.
CIMRST	Commission Interministérielle de la Recherche Scientifique et Technique.
CNER	Comité National d'Evaluation de la Recherche
CNES	Centre National d'Etudes Spatiales
CNRS	Centre National de Recherche Scientifique.
CST	Centre Spatial de Toulouse.
DAM	Direction des Applications Militaires.
DAT	Direction de l'Armement Terrestre,
DBS	Direct Broadcasting by Satellite.
DCN	Direction des Constructions Navales.
DCAé	Direction des Constructions Aéronautiques.
DEFA	Direction des Etudes et Fabrication d'Armement.
DEI	Direction de l'Eléctronique et de l'Informatique.
DEN	Direction des Engins.
DGA	Délégation Générale pour l'Armement.
DGE	Délégation Générale à l'Espace.
DGI	Direction Générale de l'Industrie
DGRST	Délégation générale à la recherche scientifique et technique.

DGT	Direction Générale des Télécommunications.
DIELI	Direction des Industries Eléctroniques et d'Informatique.
DMA	Délégation Ministérielle à l'Armement.
DOM-TOM	Départements et Territoires d'Outre-Mer.
DOPR	Direction de l'Organisation et de la Promotion de la Recherche.
DRET	Direction des Recherches, Etudes et Techniques,
DRME	Direction des Recherches et Moyens d'Essai.
EBRD	Effort Budgétaire de Recherche et de Développement.
ELDO	European Launcher Development Organization.
EMA	Etat-Major des Armées.
ENA	Ecole Nationale d'Administration
EPIC	Etablissement Public à caractère Industriel et Commercial.
ESA	European Space Agency.
ESRO	European Space Research Organization.
FEDN	Fondation pour les Etudes de Défense Nationale.
FNS	Force Nucléaire Stratégique.
FOST	Force Océanique Stratégique.
GCSM	Groupe de Coordination Spatiale Militaire
GEIP	Groupement Européen Indépendant de Programme
GES	Groupe d'Etudes Spatiales.
GIE	Groupement d'Intérêt Economique
GROUPES	Groupe de Planification et d'Etudes Stratégiques.
ICA	Ingénieur en Chef de l'Armement
ICBM	Intercontinental Ballistic Missile.
IFA	Institut Franco-Allemand de Saint Louis.
IFP	Institut Français du Pétrole
IGA	Ingénieur Général de l'Armement.
IISS	International Institute of Strategic Studies.
LOP	Loi d'Orientation et de Programmation.
LRBA	Laboratoire de Recherches Balistiques et Aérodynamiques.
MATRA	Société Mécanique-Aviation-Traction.
MDIS	Ministère du Développement Industriel et Scientifique.
MIC	Military Industrial Complex.
MPTE	Ministère des Postes, Télécommunications et de l'Espace.
MRT	Ministère de la Recherche et de la Technologie.
MSBS	Mer-Sol Balistique Stratégique.
OECD	Organisation for Economic Cooperation and Development.

ONERA	Office National d'Etudes et Recherches Aéronautiques.
OPECST	Office Parlementaire d'Evaluation des Choix Scientifiques et Technologiques.
PDG	Président Directeur Général.
PDT	Programme de Développement Technologique.
PPE	Division Plans-Programmes-Espace.
PPSM	Plan Pluriannuel Spatial Militaire.
Ps	Parti Socialiste.
PTT	Postes, Téléphones et Télécommunications.
RITA	Réseau Intégré de Transmissions automatisées.
RPR	Rassemblement Pour la République
SAMRO	Satellite Militaire de Reconnaissance Optique.
SDI	Strategic Defence Initiative.
SDIO	Strategic Defence Initiative Organization.
SEP	Société Européenne de Propulsion
SEREB	Société d'Etudes et de Réalisation d'Engins Balistiques
SERICS	Service des Industries de Commerce et de Service.
SGDN	Secrétariat Général de la Défense Nationale
SIRPA	Service d'Information et de Relations Publiques des Armées.
SNECMA	Société Nationale d'Etudes et de Construction de Moteurs d'Aviation.
SNIAS	Société Nationale Industrielle Aérospatiale.
SNLE	Sous Marin Nucléaire Lanceur d'Engins.
SNLE-NG	Sous Marin Nucléaire Lanceur d'Engins Nouvelle Génération
SPOT	Satellite Probatoire d'Observation Optique.
SSBS	Sol-Sol Balistique Stratégique.
STCAN	Service Technique des Constructions et Armes Navales.
STEN	Service Technique des Engins.
STPE	Service Technique des Poudres et Explosifs.
SYRACUSE	Système de Radiocommunication Utilisant un Satellite.
TDF	Télédiffusion de France.
TDF1	Télédiffusion de France 1 (Satellite).
TOEE	Département Terre, Océan, Environnement et Espace au MRT.
UDF	Union pour la Démocratie Française.
UEO	Union de l'Europe Occidentalle (=WEU).
WEU	Western European Union.

Appendix I

CNES statute documents

Présidence du Conseil,
Décret du 7 janvier 1959 relatif à la création d'un Comité de recherches spatiales.

Ministre délégué auprès du Premier ministre,
Décret No. 61-703 du 3 juillet 1961 modifiant le décret du 7 janvier 1959 relatif à la création d'un Comité des recherches spatiales.

Loi No. 61-1382 instituant un centre national d'études spatiales.

Ministres délégués auprès du Premier ministre,
Décret No. 62-153 du 10 février 1962 pris pour l'application de la loi No. 61-1382 du 19 décembre 1961 et relatif au fonctionnement administratif et financier du centre national d'études spatiales.

Ministre d'Etat chargé de la recherche scientifique et des questions atomiques et spatiales,
Modalités de fonctionnement financier du centre national d'études spatiales, 14 septembre 1963.

Ministère de l'industrie et de la recherche,
Décret No. 76-104 du 27 janvier 1976 relatif au centre national d'études spatiales et à l'organisation de la recherche spatiale.

Décret No. 79-977 du 22 août 1977 modifiant le décret No. 76-104 du 27 janvier 1976 relatif au centre national d'études spatiales et à l'organisation de la recherche spatiale.

Ministère de l'industrie,
Décret No. 79-468 du 13 juin 1979 modifiant le décret No. 76-104 du 27 janvier 1976 relatif au centre national d'études spatiales.

Modalités de fonctionnement financier du Centre national d'études spatiales, 24 février 1984.

Ministèrede l'industrie et de la recherche.
Décret No. 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales.

Ministère des P.T.T.,
Décret No. 86-129 du 28 janvier 1986 portant organisation de l'administration centrale du ministère des P.T.T.

Ministère de l'industrie, des P. et T. et du tourisme,
Décret No. 86-715 du 17 avril 1986 relatif aux attributions du ministre de l'industrie, des P. et T. et du tourisme.

Recherche et enseignement supérieur,
Décret No. 86-721 du 24 avril 1986 relatif aux attributions du ministre délégué auprès du ministre de l'éducation nationale, chargé de la recherche et de l'enseignement supérieur.

Ministère de l'éducation nationale, de la recherche et des sports,
Décret No. 88-726 du 28 mai 1988 relatif aux attributions du ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports.

Ministère des postes et télécommunications et de l'espace,
Décret No. 88-741 du 3 juin 1988 relatif aux attributions du ministre des postes et télécommunications et de l'espace.

Ministère des postes et télécommunications et de l'espace,
Décret No. 88-837 du 20 juillet 1988 relatif aux attributions du ministre des postes, des télécommunications et de l'espace.

Ministère de la recherche et dela technologie,
Décret No. 88-838 du 20 juillet 1988 relatif aux attributions du ministre de la recherche et de la technologie.

Ministère des postes et télécommunications et de l'espace,
Décret No. 88-1121 du 14 décembre 1988 modifiant le décret No. 86-129 du 28 janvier modifié portant organisation de l'administration centrales du ministère des P.T.T..

Ministère des postes et télécommunications et de l'espace,

Décret du 6 janvier 1989 portant nomination d'un délégué général à l'administration centrale.

Ministère des postes et télécommunications et de l'espace,
Décret No. 89-77 du 6 février 1989 modifiant le décret No. 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales.

Ministère des postes et télécommunications et de l'espace,
Décret No. 89-508 du 19 juillet portant création du comité de l'espace.

Ministère des postes et télécommunications et de l'espace,
Arrêté du 20 juillet 1990 relatif aux modalités de fonctionnement du Centre national d'études spatiales.

Ministère des postes et télécommunications et de l'espace,
Arrêté du 20 juillet 1990 fixant la composition et les règles de fonctionnement de la commission des marchés du Centre national d'études spatiales.

Ministère des postes et télécommunications et de l'espace,
Décret No.90-1121 du 18 décembre 1990 portant organisation de l'administration centrale du ministère des postes, des télécommunications et de l'espace.

PRESIDENCE DU CONSEIL

Décret du 7 janvier 1959 relatif à la création d'un comité de recherches spatiales.

Le président du conseil des ministres,

Sur le rapport du ministre d'Etat, du ministre des affaires étrangères, et du ministre de l'éducation nationale,

Vu la Constitution du 5 octobre 1958, et notamment ses articles 34 et 37, fixant la répartition des attributions entre les domaines législatif et réglementaire,

Décrète :

Art. 1er. — Il est créé à la présidence du conseil et auprès du délégué général à la recherche scientifique et technique un comité des recherches spatiales.

Art. 2. — Le comité des recherches spatiales comprend :

Le président du comité d'action scientifique de la défense nationale ;

Le directeur général de l'office national d'études et de recherches aéronautiques ;

Le directeur de l'Observatoire de Paris ;

Le directeur du centre national de la recherche scientifique ;

Le directeur général de l'enseignement supérieur ;

Le directeur général des affaires culturelles et techniques au ministère des affaires étrangères ;

Un représentant du ministère des finances.

Le président du comité peut appeler à y siéger toute personnalité susceptible de participer utilement aux travaux en cours ainsi que les représentants des ministères ou services intéressés.

Art. 3. — La désignation du président du comité des recherches spatiales appartient, après délibération du comité, au délégué général à la recherche scientifique et technique en sa qualité de représentant du premier ministre.

Art. 4. — Le comité a pour mission :

a) De recenser les moyens dont la France dispose dans le domaine des recherches spatiales ;

b) De présenter des propositions au premier ministre pour l'établissement et l'exécution d'un programme de recherches spatiales ;

c) De diriger la mise en application du programme qui aura été arrêté dans ce domaine par le gouvernement.

Il sera tenu au courant de toute activité nationale et internationale concernant les problèmes de l'espace et tiendra le gouvernement au courant de tout projet international dont il sera informé en ces matières.

Art. 5. — Le comité soumettra un rapport d'activité annuel au Gouvernement ; il présentera entre temps toute communication qui lui paraîtra nécessaire.

Art. 6. — Le ministre d'Etat, le ministre des affaires étrangères, le ministre des finances et des affaires économiques et le ministre de l'éducation nationale sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret.

Fait à Paris, le 7 janvier 1959.

C. DE GAULLE.

Par le président du conseil des ministres :

Le ministre d'Etat,
LOUIS JOXE.

Le ministre des affaires étrangères,
MAURICE COUVE DE MURVILLE.

Le ministre des finances et des affaires économiques,
ANTOINE PINAY.

Le ministre de l'éducation nationale,
JEAN BERTHOIN.

LOI n° 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales (1).

L'Assemblée nationale et le Sénat ont adopté,

Le Président de la République promulgue la loi dont la teneur suit :

Art. 1er. — Il est institué sous le nom de Centre national d'études spatiales un établissement public scientifique et technique, de caractère industriel et commercial, doté de l'autonomie financière et placé sous l'autorité du Premier ministre.

Art. 2. — Le centre national d'études spatiales a pour mission de développer et d'orienter les recherches scientifiques et techniques poursuivies dans le domaine des recherches spatiales.

Il est notamment chargé :

1° De recueillir toutes informations sur les activités nationales et internationales concernant les problèmes de l'espace, son exploration et son utilisation ;

2° De préparer et de proposer à l'approbation du comité interministériel de la recherche scientifique et technique les programmes de recherche d'intérêt national dans ce domaine ;

3° D'assurer l'exécution desdits programmes, soit dans les laboratoires et établissements techniques créés par lui, soit par le moyen de conventions de recherche passées avec d'autres organismes publics ou privés, soit par des participations financières ;

4° De suivre, en liaison avec le ministère des affaires étrangères, les problèmes de coopération internationale dans le domaine de l'espace et de veiller à l'exécution de la part des programmes internationaux confiée à la France ;

5° D'assurer soit directement, soit par des souscriptions ou l'octroi de subventions, la publication de travaux scientifiques concernant les problèmes de l'espace.

Art. 3. — Le centre national d'études spatiales assure sa gestion financière et présente sa comptabilité suivant les usages du commerce.

Art. 4. — Pour le financement des diverses missions prévues à l'article 2, le centre national d'études spatiales dispose notamment des crédits budgétaires ouverts pour les recherches spatiales dans chacun des budgets annuels en exécution de la loi de programme d'actions complémentaires coordonnées de recherche scientifique et technique n° 61-530 en date du 31 mai 1961.

Le centre sera, dès la promulgation de la présente loi, substitué à l'Etat dans les conventions de recherche spatiale passées sur le chapitre (56-00) du budget du Premier ministre intitulé « Fonds de développement de la recherche scientifique et technique ».

Art. 5. — Un décret en Conseil d'Etat fixera les conditions d'application de la présente loi et déterminera, notamment, les règles de fonctionnement administratif et financier de l'établissement, la composition du conseil d'administration, les attributions respectives du conseil d'administration, de son président et du directeur général du centre.

Art. 6. — Le centre national d'études spatiales déposera chaque année, devant le Parlement, avant le vote du budget, un rapport sur son activité et les résultats obtenus pendant l'année écoulée.

La présente loi sera exécutée comme loi de l'Etat.

Fait à Paris, le 19 décembre 1961.

C. DE GAULLE.

Par le Président de la République :

Le Premier ministre,
MICHEL DEBRÉ.

Le ministre délégué auprès du Premier ministre,
PIERRE GUILLAUMAT.

Le ministre des affaires étrangères,
MAURICE COUVE DE MURVILLE.

Le ministre des finances et des affaires économiques,
WILFRID BAUMGARTNER.

Le ministre de l'éducation nationale,
LUCIEN PAYE.

MINISTRE DELEGUE AUPRES DU PREMIER MINISTRE

Décret n° 61-703 du 3 juillet 1961 modifiant le décret du 7 janvier 1959 relatif à la création d'un comité des recherches spatiales.

Le Premier ministre,

Sur le rapport du ministre délégué auprès du Premier ministre, du ministre des affaires étrangères et du ministre de l'éducation nationale,

Vu le décret n° 58-1144 du 28 novembre 1958 concernant la recherche scientifique et technique, modifié par le décret n° 61-362 du 8 avril 1961 ;

Vu le décret du 7 janvier 1959 relatif à la création d'un comité des recherches spatiales ;

Vu le décret du 16 novembre 1959 portant nomination au comité des recherches spatiales ;

Vu le décret n° 60-242 du 19 mars 1960 relatif aux attributions du ministre délégué auprès du Premier ministre,

Décrète :

Art. 1er. — Le décret susvisé du 7 janvier 1959 relatif à la création d'un comité des recherches spatiales est abrogé et remplacé par les dispositions suivantes :

« *Art. 1er.* — Il est créé auprès du Premier ministre (délégation générale à la recherche scientifique et technique) un comité des recherches spatiales.

« *Art. 2.* — Le comité des recherches spatiales comprend :

« M. Pierre Auger, professeur à la Sorbonne.
« Le haut-commissaire à l'énergie atomique.
« Le directeur général des affaires culturelles et techniques au ministère des affaires étrangères.
« Le chef du service des affaires spatiales au ministère des affaires étrangères.
« Le directeur des recherches et moyens d'essais au ministère des armées.
« Le directeur du département Engins à la délégation ministérielle pour l'armement.
« Le chef d'état-major interarmées.
« Le directeur général de l'office national d'études et de recherches aéronautiques.
« Un représentant du chef d'état-major général de la défense nationale.
« Un représentant du ministre des finances et des affaires économiques.
« Le directeur général de l'enseignement supérieur.
« Le directeur du centre national de la recherche scientifique.
« Le directeur de l'Observatoire de Paris.
« Le président du Bureau des longitudes.
« Le président de la section IV (astronomie, astrophysique, physique du globe) du comité national de la recherche scientifique.
« Le président de la section IX (physique nucléaire et physique corpusculaire) du comité national de la recherche scientifique.
« Le président de la section X (électronique, électricité, magnétisme) du comité national de la recherche scientifique.
« Le directeur de la météorologie nationale.
« Le directeur de l'institut géographique national.
« Le directeur de l'institut national d'hygiène.
« Le directeur du centre national d'études des télécommunications.
« Le directeur des services techniques de la radiodiffusion-télévision française.

« Le président du comité peut appeler à y siéger toute personnalité susceptible de participer utilement aux travaux en cours ainsi que les représentants des ministères ou services intéressés.

« *Art. 3.* — Le président du comité est nommé par arrêté du ministre délégué auprès du Premier ministre.

« *Art. 4.* — Le comité a pour mission :

« De recenser les moyens dont la France dispose dans le domaine des recherches spatiales ;
« De présenter des propositions au Premier ministre pour l'établissement d'un programme de recherches spatiales ;
« De donner avis au Premier ministre sur toutes questions concernant les problèmes de l'espace, notamment en matière de coopération internationale ;
« De soumettre au Gouvernement un rapport annuel sur l'exécution des programmes de recherches spatiales.
« De coordonner l'action des différents départements ministériels intéressés au développement des recherches spatiales.

« *Art. 5.* — Le président du comité des recherches spatiales a pour mission :

« De diriger la mise en application du programme de recherches spatiales arrêté par le Gouvernement ;
« De suivre, en liaison avec les services du ministère des affaires étrangères et le délégué général à la recherche scientifique et technique, les problèmes de coopération internationale dans le domaine de l'espace.
« Il tient le comité informé des résultats de sa mission.

« *Art. 6.* — Pour l'accomplissement de sa mission, le président dispose du personnel, des locaux et des moyens matériels mis à sa disposition par la délégation générale à la recherche scientifique et technique ».

Art. 2. — Le ministre délégué auprès du Premier ministre, le ministre des affaires étrangères, le ministre des finances et des affaires économiques et le ministre de l'éducation nationale sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret.

Fait à Paris, le 3 juillet 1961.

MICHEL DEBRÉ.

Par le Premier ministre :
Le ministre délégué auprès du Premier ministre,
PIERRE GUILLAUMAT.

Le ministre des affaires étrangères,
MAURICE COUVE DE MURVILLE.

Le ministre des finances et des affaires économiques,
WILFRID BAUMGARTNER.

Le ministre de l'éducation nationale,
LUCIEN PAYE.

MINISTERE D'ETAT CHARGE DE LA RECHERCHE SCIENTIFIQUE ET DES QUESTIONS ATOMIQUES ET SPATIALES

Modalités de fonctionnement financier du centre national d'études spatiales.

Le ministre des finances et des affaires économiques et le ministre d'Etat chargé de la recherche scientifique et des questions atomiques et spatiales,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales ;

Vu le décret n° 62-153 du 10 février 1962 pris pour l'application de la loi n° 61-1382 du 19 décembre 1961 et relatif au fonctionnement administratif et financier du centre national d'études spatiales, notamment son article 15 ;

Vu le décret n° 62-1587 du 29 décembre 1962 portant règlement général sur la comptabilité publique,

Arrêtent :

Art. 1er. — Le fonctionnement financier et comptable du centre national d'études spatiales est assuré dans les conditions fixées par le décret susvisé du 29 décembre 1962 portant règlement général sur la comptabilité publique, selon les modalités définies ci-après.

Art. 2. — Un état de prévision de recettes et de dépenses est établi pour chaque exercice annuel commençant en principe le 1er janvier ; cette date peut être modifiée par le président du conseil d'administration avec l'accord du contrôleur d'Etat.

L'état fait apparaître, sous deux sections distinctes, les opérations relatives au fonctionnement et les opérations en capital. Il est divisé en chapitres qui ne doivent comprendre que des dépenses ou des recettes de même nature et est conforme à la nomenclature comptable visée à l'article 218 du décret susvisé du 29 décembre 1962. Les opérations en capital peuvent donner lieu à des prévisions d'exécution échelonnées sur plusieurs années. Les prévisions inscrites aux chapitres dont l'énumération est fixée par arrêté du ministre des finances ont un caractère limitatif.

Art. 3. — Les prévisions en matière d'investissements doivent présenter le coût total des opérations à engager et l'échelonnement éventuel sur plusieurs années des paiements correspondants.

Art. 4. — L'état de prévision est préparé par le directeur général et délibéré par le conseil d'administration de façon à être soumis à l'approbation du ministre d'Etat chargé de la recherche scientifique et des questions atomiques et spatiales et du ministre des finances et des affaires économiques, dans les conditions prévues à l'article 6 du décret susvisé n° 62-153 du 10 février 1962, deux mois au plus tard avant la date du début de l'exercice.

Si l'état n'est pas encore approuvé à l'ouverture de l'exercice, l'ordonnateur peut, néanmoins, dans la limite des fonds disponibles et avec l'agrément du contrôleur d'Etat, engager les dépenses antérieurement autorisées et ordonner les paiements correspondants. Il peut en outre, dans la double limite des prévisions adoptées par le conseil d'administration et des crédits approuvés au titre de l'année précédente, engager, sauf opposition du contrôleur d'Etat, les dépenses indispensables à la continuité de la gestion.

Les modifications reconnues nécessaires en cours d'exercice sont délibérées et approuvées dans les mêmes formes que l'état annuel de prévision. Toutefois, sauf en cas de désaccord du contrôleur d'Etat, les délibérations du conseil d'administration portant transfert de crédits entre chapitres à l'intérieur de chacune des deux sections n'ont pas à être soumises à l'approbation des ministres.

Art. 5. — Le président du conseil d'administration a qualité d'ordonnateur principal. Il peut, sous sa responsabilité, déléguer une partie de ses pouvoirs au directeur général, ou, après avis de celui-ci, à un ou plusieurs des chefs de service placés sous l'autorité du directeur général.

Toutefois, pour l'application des articles 219 et 220 du décret susvisé du 29 décembre 1962, le directeur général a qualité d'ordonnateur.

Art. 6. — Des avances peuvent être consenties dans les conditions fixées par l'ordonnateur, avec l'accord du contrôleur d'Etat, aux personnes chargées de mission pour le compte du centre ainsi qu'aux personnes, sociétés ou organismes mandatés par le centre pour opérer pour son compte. Le mode de justification de ces avances est déterminé par l'agent comptable.

Art. 7. — Les fonds déposés à la Banque de France et, avec l'autorisation du ministre des finances, en banque ne peuvent excéder un montant fixé par l'ordonnateur en accord avec le contrôleur d'Etat.

Art. 8. — Les conditions générales de passation, de financement et de contrôle des marchés sont fixées par le conseil d'administration. Elles s'inspirent de la réglementation des marchés de l'Etat.

Il est institué au C. N. E. S. une commission des marchés. La composition et les règles de fonctionnement de cette commission seront fixées par un arrêté du ministre des finances et du ministre chargé de la recherche scientifique et des questions atomiques et spatiales.

Art. 9. — Des régies d'avances et des régies de recettes peuvent être instituées par arrêté du ministre des finances et des affaires économiques et du ministre d'Etat chargé de la recherche scientifique et des questions atomiques et spatiales. Les régisseurs sont désignés par le président du conseil d'administration avec l'accord de l'agent comptable. Ils peuvent être dispensés de constituer cautionnement ; dans ce cas, la responsabilité pécuniaire de l'agent comptable couvre l'ensemble de leurs opérations.

En accord avec l'agent comptable, des sous-régies peuvent être instituées par décision du président du conseil d'administration, selon des modalités fixées par le conseil d'administration.

Art. 10. — Dans les trois mois qui suivent la transmission de l'avis de la commission de vérification des comptes, un arrêté du ministre d'Etat chargé de la recherche scientifique et des questions atomiques et spatiales et du ministre des finances et des affaires économiques statue sur l'approbation des comptes et fixe définitivement le bilan.

Art. 11. — Le présent arrêté sera publié au *Journal officiel* de la République française.

Fait à Paris, le 29 août 1963.

Le ministre d'Etat chargé de la recherche scientifique et des questions atomiques et spatiales,
GASTON PALEWSKI.

Le ministre des finances et des affaires économiques,
Pour le ministre et par délégation :
Le directeur du budget,
RAYMOND MARTINET.

MINISTRES DELEGUES AUPRES DU PREMIER MINISTRE

Décret n° 62-153 du 10 février 1962 pris pour l'application de la loi n° 61-1382 du 19 décembre 1961 et relatif au fonctionnement administratif et financier du centre national d'études spatiales.

Le Président de la République,

Sur le rapport du Premier ministre, du ministre délégué auprès du Premier ministre et du ministre des finances et des affaires économiques,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales, et notamment son article 5 ;

Vu le décret du 7 janvier 1959 relatif à la création d'un comité des recherches spatiales, modifié par le décret n° 61-703 du 3 juillet 1961 ;

Vu le décret n° 55-733 du 26 mai 1955 relatif au contrôle économique et financier de l'Etat ;

Le Conseil d'Etat (section de l'intérieur) entendu,

Décrète :

Art. 1er. — Le conseil d'administration du centre national d'études spatiales est composé comme suit :

Le directeur général du centre national de la recherche scientifique.

Le directeur de l'Observatoire de Paris.

Le directeur des recherches et moyens d'essais au ministère des armées.

Quatre personnalités qualifiées en raison de leur compétence dans le domaine scientifique ou industriel.

Trois hauts fonctionnaires relevant du Premier ministre ou des départements ministériels intéressés.

Les membres autres que les membres de droit sont désignés pour une durée de cinq ans par arrêté du ministre délégué auprès du Premier ministre.

Le mandat des membres sortants peut être renouvelé.

Les membres du conseil d'administration décédés ou démissionnaires et ceux qui, en cours de mandat, cessent d'exercer les fonctions en raison desquelles ils ont été désignés doivent être remplacés. Dans ce cas, le mandat des nouveaux membres expire à la date à laquelle aurait normalement pris fin celui de leurs prédécesseurs.

Art. 2. — Le président du conseil d'administration, choisi parmi les administrateurs, est nommé pour une durée de cinq ans par décret en conseil des ministres pris sur le rapport du Premier ministre et du ministre délégué auprès du Premier ministre.

Le conseil d'administration désigne dans son sein, dès sa nomination et après chaque renouvellement, un vice-président chargé, en cas d'absence ou d'empêchement du président, de remplir les fonctions de ce dernier au cours des séances.

Art. 3. — Le conseil d'administration se réunit sur la convocation de son président au moins huit fois par an et plus souvent si les besoins l'exigent. Le président réunit immédiatement le conseil s'il y est invité soit par le ministre délégué auprès du Premier ministre, soit par la majorité des membres.

Le conseil ne peut valablement délibérer que si la majorité des membres en exercice assistent à la séance. Les délibérations sont prises à la majorité absolue des votants.

En cas de partage, la voix du président est prépondérante.

Les procès-verbaux sont signés du président et notifiés au ministre délégué auprès du Premier ministre.

Le délégué général à la recherche scientifique et technique et le contrôleur d'Etat assistent aux réunions du conseil d'administration.

Art. 4. — Sur proposition du président, le conseil d'administration délibère sur les objets suivants :

Programme des activités et des investissements du centre, conformément à la mission qui lui est confiée par l'article 2 de la loi susvisée du 19 décembre 1961.

Plan d'organisation et de fonctionnement des services du centre.

Etat annuel des prévisions de recettes et de dépenses et, s'il y a lieu, états rectificatifs en cours d'année.

Approbation du rapport annuel d'activité, du bilan et des comptes annuels.

Proposition relative à la fixation et à l'affectation des bénéfices et à la constitution des réserves.

Approbation des emprunts à court terme et à long terme, même s'ils ne comportent pas nantissement ou hypothèques, ainsi que toutes les émissions d'obligations.

Approbation des projets de conventions de recherche.

Approbation des projets de marchés, d'achats et de ventes d'immeubles, constitution de nantissements et d'hypothèques, projets de baux et locations d'immeubles.

Prises, extensions ou cessions de participations financières.

Octroi d'avances.

Acceptation ou refus des dons et legs.

Régime de recrutement, d'emploi et de rémunération du personnel.

Le conseil d'administration peut également, dans les limites qu'il détermine, autoriser le président à passer sans son approbation préalable les conventions de recherche et les marchés.

Art. 5. — Les délibérations relatives aux objets sur lesquels le conseil peut décider sans approbation ministérielle sont exécutoires si, dans les huit jours qui suivent la notification du procès-verbal, elles ne sont pas frappées d'opposition par le ministre délégué auprès du Premier ministre. En cas d'opposition, le ministre doit statuer dans un délai d'un mois à partir de l'opposition ; passé ce délai, la délibération devient exécutoire.

Le ministre ne peut annuler une délibération que par décision motivée.

Art. 6. — Ne sont exécutoires qu'après avoir été approuvées par le ministre délégué auprès du Premier ministre et le ministre des finances et des affaires économiques les délibérations portant sur les objets ci-après :

Etablissement et modification des états de prévisions de recettes et de dépenses.

Compte de pertes et profits, bilan, fixation des amortissements, prévisions, réserve et affectation des bénéfices.

Emprunts.

Prises, extensions ou cessions de participations financières.

Régime de recrutement, d'emploi et de rémunération du personnel.

Art. 7. — Le comité de recherches spatiales, créé par le décret du 7 janvier 1959, modifié par le décret du 3 juillet 1961, prend le nom de Conseil de l'espace. Il est complété par l'adjonction des personnalités suivantes :

Le commissaire général du plan.

Le délégué général à la recherche scientifique et technique.

Le président du comité consultatif de la recherche scientifique et technique.

Le président du comité d'action scientifique de la défense.

Le doyen de la faculté des sciences de Paris.

Le président de la section XVI (Biologie cellulaire) du conseil national de la recherche scientifique.

Le conseil de l'espace est présidé par le président du centre national d'études spatiales ; il se réunit à la diligence de celui-ci.

Il examine l'ensemble des projets de recherche relevant de la compétence du centre ; il donne son avis sur leur contenu et leur mode d'exécution par les différents organismes intéressés avant que le conseil d'administration n'arrête ses programmes. Il peut être consulté par son président sur toute question concernant l'espace, et notamment sur le fonctionnement du centre.

Le conseil, sur proposition de son président, peut constituer des commissions d'études.

Art. 8. — Le président du conseil d'administration représente le centre dans les négociations internationales et dans tous les actes de la vie civile. Il assure l'exécution des délibérations du conseil d'administration ; il a qualité notamment pour :

1° Passer au nom du centre tous actes, contrats, traités ou marchés ; émettre, endosser ou avaliser tous effets de commerce, établir tous ordres de vente, ordonnancer et liquider toutes dépenses, recevoir toutes sommes dues au centre et en donner quittance ou décharge ;

2° Procéder à toutes acquisitions, dépôts ou cessions de brevets ou de licences, autoriser tous compromis, acquiescements, désistements ou toutes mainlevées d'inscription, de saisie et d'opposition, avant ou après paiement, représenter le centre en justice, déterminer l'emploi des fonds disponibles et le placement des réserves, procéder à toutes acquisitions, aliénations et transferts de valeurs ;

3° Procéder, sous réserve des approbations prévues à l'article 4 ci-dessus, à tous achats, ventes ou locations d'immeubles, contracter tous emprunts, constituer nantissement ou hypothèques ;

4° Conclure les contrats individuels de travail, nommer, licencier les membres du personnel de toutes catégories. Toutefois, les nominations aux emplois de chefs de service ne peuvent intervenir qu'après avis du conseil d'administration ;

5° Préparer le rapport annuel d'activité en vue de son examen par le conseil d'administration.

Le président est assisté d'un directeur général auquel il peut déléguer une partie des pouvoirs qu'il tient en vertu des alinéas qui précèdent. Il peut également déléguer certaines attributions aux chefs de service sous l'autorité du directeur général.

Art. 9. — Le directeur général du centre national d'études spatiales est nommé par décret sur proposition du ministre délégué auprès du Premier ministre. Il assiste aux séances du conseil d'administration avec voix consultative.

Le directeur général est chargé, selon les directives du président, de la mise en œuvre des décisions du conseil d'administration concernant l'organisation et le fonctionnement des services du centre ; il a autorité sur l'ensemble du personnel ; il est responsable de la préparation des états annuels de prévision de recettes et de dépenses, des comptes et du bilan annuel du centre.

Art. 10. — Les émoluments et indemnités du président et du directeur général, ainsi que les jetons de présence qui peuvent être alloués aux membres du conseil d'administration, sont fixés par le ministre délégué auprès du Premier ministre et le ministre des finances et des affaires économiques.

Art. 11. — Le président du centre adresse au ministre délégué auprès du Premier ministre et au ministre des finances le rapport annuel sur l'activité du centre préalablement examiné par le conseil d'administration. Ce rapport est transmis par le ministre délégué au Parlement, conformément à l'article 6 de la loi du 19 décembre 1961.

Art. 12. — Le contrôle de la gestion financière du centre est exercé, sous l'autorité du ministre des finances et des affaires économiques, par un contrôleur d'Etat. Dans le cadre des lois et règlements en vigueur, un arrêté précisera en tant que de besoin les modalités d'application du présent article.

Les rapports du contrôleur d'Etat au ministre des finances sont adressés au ministre délégué auprès du Premier ministre. Le rapport annuel est également communiqué au conseil d'administration.

Art. 13. — Les opérations du centre sont soumises au contrôle de la commission de vérification des comptes des entreprises publiques instituée par l'article 56 de la loi du 6 janvier 1948.

Art. 14. — Les articles 3 à 6 du décret susvisé du 7 janvier 1959 portant création du comité de recherches spatiales, modifié par le décret du 3 juillet 1961, sont abrogés.

Art. 15. — Un arrêté conjoint du ministre délégué auprès du Premier ministre et du ministre des finances et des affaires économiques précise les modalités du fonctionnement financier du centre et détermine notamment le rôle de l'agent comptable nommé par arrêté du ministre des finances et des affaires économiques, après avis du conseil d'administration.

Art. 16. — Le Premier ministre, le ministre délégué auprès du Premier ministre et le ministre des finances et des affaires économiques sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 10 février 1962.

C. DE GAULLE.

Par le Président de la République :

Le Premier ministre,
MICHEL DEBRÉ.

Le ministre délégué auprès du Premier ministre,
PIERRE GUILLAUMAT.

Le ministre des affaires étrangères,
MAURICE COUVE DE MURVILLE.

Le ministre des finances et des affaires économiques,
VALÉRY GISCARD D'ESTAING.

Le ministre de l'éducation nationale,
LUCIEN PAYE.

Conseil d'administration du centre national d'études spatiales.

ARRÊTÉ PORTANT NOMINATION DES MEMBRES

Le ministre délégué auprès du Premier ministre,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales ;

Vu le décret n° 62-153 du 10 février 1962 pris pour l'application de la loi n° 61-1382 du 19 décembre 1961 et relatif au fonctionnement administratif et financier du centre national d'études spatiales,

Arrête :

Article unique. — Sont nommés membres du conseil d'administration du centre national d'études spatiales :

En tant que membres de droit :

M. Jean Coulomb, directeur général du centre national de la recherche scientifique.

M. André Danjon, directeur de l'Observatoire de Paris.

M. Lucien Malavard, directeur des recherches et moyens d'essais à l'administration centrale du ministère des armées.

En tant que personnalités qualifiées en raison de leur compétence dans le domaine scientifique ou industriel :

M. Pierre Auger, professeur à la faculté des sciences de l'université de Paris.

M. Pierre Grivet, professeur à la faculté des sciences de l'université de Paris.

M. Maurice Pascal, ingénieur en chef du génie maritime.

M. Jean Voge, ingénieur en chef des télécommunications.

En tant que hauts fonctionnaires relevant du Premier ministre et des départements ministériels intéressés :

M. Jean Donnedieu de Vabres, maître des requêtes au Conseil d'Etat.

M. Jean de La Chevardière de La Grandville, chef du service des affaires spatiales au ministère des affaires étrangères.

M. Pierre Magniez, sous-directeur au ministère des finances.

Les membres autres que les membres de droit sont nommés pour une durée de cinq ans.

Fait à Paris, le 10 février 1962.

PIERRE GUILLAUMAT.

DÉCRET PORTANT NOMINATION DU PRÉSIDENT

Le Président de la République,

Sur le rapport du Premier ministre et du ministre délégué auprès du Premier ministre,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales ;

Vu le décret n° 62-153 du 10 février 1962 pris pour l'application de la loi n° 61-1382 du 19 décembre 1961 relatif au fonctionnement administratif et financier du centre national d'études spatiales, et notamment son article 2 ;

Vu l'arrêté du 10 février 1962 nommant les membres du conseil d'administration du centre national d'études spatiales ;

Le conseil des ministres entendu,

Décrète :

Art. 1er. — M. Pierre Auger, professeur à la faculté des sciences de l'université de Paris, est nommé président du conseil d'administration du centre national d'études spatiales.

Art. 2. — Le Premier ministre et le ministre délégué auprès du Premier ministre sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 10 février 1962.

C. DE GAULLE.

Par le Président de la République :

Le Premier ministre,
MICHEL DEBRÉ.

Le ministre délégué auprès du Premier ministre,
PIERRE GUILLAUMAT.

MINISTERE DE L'INDUSTRIE ET DE LA RECHERCHE

Décret n° 76-104 du 27 janvier 1976 relatif au centre national d'études spatiales et à l'organisation de la recherche spatiale.

Le Président de la République,

Sur le rapport du Premier ministre, du ministre de l'économie et des finances et du ministre de l'industrie et de la recherche,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales, et notamment son article 5 ;

Vu l'article 56 de la loi n° 48-24 du 6 janvier 1948 relative à diverses dispositions d'ordre budgétaire ;

Vu le décret n° 68-707 du 2 août 1963 modifié relatif au contrôle de l'Etat sur les entreprises publiques nationales et certains organismes ayant un objet d'ordre économique ou social ;

Vu le décret n° 55-733 du 26 mai 1955 modifié relatif au contrôle économique et financier de l'Etat ;

Vu le décret n° 62-1587 du 29 décembre 1962 portant règlement général sur la comptabilité publique ;

Vu le décret n° 66-619 du 10 août 1966 relatif aux frais de déplacement des fonctionnaires de l'Etat et des établissements publics de l'Etat ;

Vu le décret n° 68-827 du 20 septembre 1968 relatif à la Cour des comptes ;

Vu le décret n° 75-1002 du 29 octobre 1975 relatif à la coordination de la politique de recherche scientifique et technique ;

Le Conseil d'Etat (section des travaux publics) entendu,

Décrète :

TITRE Ier

Organisation et fonctionnement du centre national d'études spatiales.

Art. 1er. — Le conseil d'administration du centre national d'études spatiales comprend treize membres :

Le directeur du budget au ministère de l'économie et des finances ou son représentant nommément désigné ;

Douze personnalités qualifiées en raison de leur compétence dans les domaines d'activité du centre.

Les membres du conseil d'administration sont nommés pour trois ans par décret pris sur le rapport du ministre de l'industrie et de la recherche ; leur mandat est renouvelable. Les membres décédés ou démissionnaires doivent être remplacés. Dans ce cas, le mandat des nouveaux membres expire à la date à laquelle aurait normalement pris fin celui de leurs prédécesseurs.

Les membres du conseil d'administration peuvent recevoir des jetons de présence, dont le montant est fixé conjointement par le ministre de l'économie et des finances et le ministre de l'industrie et de la recherche.

Ces membres bénéficient du remboursement des frais de déplacement ou de séjour effectivement supportés par eux à l'occasion des réunions du conseil, sur la base des taux applicables aux fonctionnaires appartenant au groupe I, dans les conditions prévues au décret susvisé du 10 août 1966.

Art. 2. — Le président du conseil d'administration est choisi parmi les douze personnalités désignées en application de l'article 1er ci-dessus. Il est nommé par décret pris en conseil des ministres, sur proposition du ministre de l'industrie et de la recherche.

Les émoluments et indemnités du président sont fixés par décision conjointe du ministre de l'industrie et de la recherche et du ministre de l'économie et des finances.

Art. 3. — Le conseil d'administration se réunit sur la convocation du président, aussi souvent qu'il est nécessaire et au moins six fois par an. Le président réunit immédiatement le conseil s'il y est invité soit par le ministre de l'industrie et de la recherche, soit par la majorité des membres.

Le conseil ne peut valablement délibérer que si la majorité des membres en exercice assistent à la séance. Les décisions sont prises à la majorité absolue des votants. En cas de partage la voix du président est prépondérante.

Le lieu, la date et l'heure ainsi que l'ordre du jour sont portés au moins huit jours à l'avance à la connaissance des membres du conseil d'administration ainsi que du contrôleur d'Etat et du commissaire du Gouvernement, qui assistent aux séances du conseil avec voix consultative.

Le conseil d'administration peut entendre, en tant que de besoin, les représentants des ministres et secrétaires d'Etat visés à l'article 16 du présent décret.

Art. 4. — Le conseil d'administration délibère sur les objets suivants :

1° Programme des activités et des investissements du centre ;

2° Plan d'organisation et de fonctionnement du centre ;

3° Etat annuel des prévisions de recettes et dépenses, et s'il y a lieu, états rectificatifs en cours d'année ;

4° Approbation du rapport annuel d'activité ;

5° Approbation du compte de pertes et profits et du bilan annuels, de l'affectation des résultats ainsi que de la fixation des taux d'amortissement, du régime et de la détermination des provisions et réserves ;

6° Approbation des emprunts à court et à long terme, même s'ils ne comportent pas nantissement ou hypothèque ;

7° Approbation des projets de conventions de recherche ;

8° Approbation des projets de marchés, d'achats et de ventes d'immeubles et des constitutions de nantissements ou d'hypothèques, des projets de baux et de location d'immeubles ;

9° Prise, extension ou cession de participations financières, octroi d'avances ;

10° Acceptation ou refus des dons et legs ;

11° Régime de recrutement, d'emploi et de rémunération du personnel ;

12° Autorisation d'entreprendre, pour la mise en œuvre du programme de relations internationales de l'établissement, des négociations pouvant conduire à la conclusion d'arrangements administratifs internationaux.

Le conseil d'administration peut, dans les limites qu'il détermine, autoriser le président à passer sans son approbation préalable des conventions de recherche ou des marchés.

Le conseil peut en outre être consulté sur toute question de la compétence du centre.

Art. 5. — Les délibérations du conseil d'administration portant sur les objets visés aux 3°, 5°, 6°, 9° et 11° de l'article précédent ne sont exécutoires qu'après avoir été approuvées par le ministre de l'industrie et de la recherche et le ministre de l'économie et des finances.

Les délibérations autres que celles ci-dessus visées sont de plein droit exécutoires si le commissaire du Gouvernement prévu à l'article 9 du présent décret n'y a pas fait opposition dans les dix jours qui suivent soit la réunion du conseil s'il y a assisté, soit la réception du procès-verbal de la séance.

Dans le cas où il forme opposition, le commissaire du Gouvernement en réfère immédiatement au ministre de l'industrie et de la recherche qui doit se prononcer dans le délai d'un mois. A défaut de décision expresse dans ce délai la délibération du conseil d'administration est exécutoire.

Art. 6. — Par application de l'article 2 (4°) de la loi susvisée du 19 décembre 1961, le ministre des affaires étrangères est associé à l'engagement, au déroulement et à la conclusion des négociations visées au 12° de l'article 4 ci-dessus.

Art. 7. — Le président du conseil d'administration représente le centre dans tous les actes de la vie civile, dans ses rapports avec les tiers et dans les relations internationales. Il assure l'exécution des délibérations du conseil d'administration.

Sous réserve des approbations nécessaires, il a notamment qualité pour :

Passer au nom du centre tous actes, contrats ou marchés ;

Procéder à toutes acquisitions, tout dépôt ou cession de brevet ou de licence ;

Représenter le centre en justice ;

Déterminer l'emploi des fonds disponibles et le placement des réserves, procéder à toutes acquisitions, aliénations et transferts de valeurs ;

Procéder à tous achats, ventes ou locations d'immeubles, contracter tous emprunts, constituer nantissement ou hypothèque.

Art. 8. — Le président du conseil d'administration est assisté d'un directeur général nommé par décret sur proposition du ministre de l'industrie et de la recherche, le président du conseil d'administration ayant été préalablement consulté.

Le directeur général est chargé, selon les directives du président, de la mise en œuvre des programmes et des opérations confiées au centre, de la préparation et de l'exécution des décisions concernant l'organisation et le fonctionnement des services.

Il a autorité sur l'ensemble du personnel ; il conclut les contrats de travail, recrute et licencie les agents de toutes catégories.

Il est chargé de la préparation des états annuels de prévision de recettes et de dépenses, des comptes et du bilan annuel du centre.

Il assiste aux séances du conseil d'administration avec voix consultative.

Le président du conseil d'administration peut déléguer au directeur général, pour l'exécution de sa mission, une partie des pouvoirs qu'il tient de l'article 7 ci-dessus.

Les émoluments et indemnités du directeur général sont fixés par décision conjointe du ministre de l'industrie et de la recherche et du ministre de l'économie et des finances.

Art. 9. — Un commissaire du Gouvernement, désigné par arrêté du ministre de l'industrie et de la recherche, est placé auprès du centre national d'études spatiales. Il peut à tout moment se faire communiquer toutes pièces, documents ou archives et procéder ou faire procéder à toute vérification. En cas d'empêchement, il peut se faire représenter aux séances du conseil d'administration par un fonctionnaire placé sous son autorité et nommément désigné.

Il informe les ministères intéressés des questions figurant à l'ordre du jour du conseil d'administration et des délibérations adoptées.

Art. 10. — Le conseil d'administration du centre national d'études spatiales est assisté d'un comité des programmes scientifiques, qui a pour mission :

a) De faire rapport sur l'intérêt scientifique des programmes de recherche soumis au centre national d'études spatiales et sur la capacité scientifique et technique des laboratoires qui proposent ces programmes ;

b) D'émettre des avis et des propositions sur les programmes de recherche propres au centre national d'études spatiales ;

c) De formuler, compte tenu des moyens disponibles, toutes propositions utiles concernant le développement de la recherche spatiale en France, et, conjointement, des autres disciplines liées à cette recherche.

Les membres de ce comité, au nombre maximum de douze, sont nommés par le ministre de l'industrie et de la recherche après avis du secrétaire d'Etat aux universités.

Le président du comité est nommé par le ministre de l'industrie et de la recherche sur proposition du président du centre national d'études spatiales.

Art. 11. — Le centre national d'études spatiales dispose des ressources suivantes :

Crédits budgétaires ouverts notamment au budget du ministère de l'industrie et de la recherche, qui lui sont affectés ;
Fonds des contrats sur programme conclus avec des départements ministériels ou avec la délégation générale à la recherche scientifique et technique ;
Produits des emprunts ;
Rémunérations de services rendus ;
Dons et legs ;
Subventions publiques ou privées ;
Produits financiers et divers.

Art. 12. — Le rapport annuel sur l'activité du centre est adressé par le président du conseil d'administration au ministre de l'industrie et de la recherche qui le transmet au Premier ministre et à tous les ministres intéressés.

Ce rapport est également transmis, par le ministre de l'industrie et de la recherche, au Parlement, conformément à l'article 6 de la loi du 19 décembre 1961 susvisée.

Art. 13. — Un arrêté conjoint du ministre de l'industrie et de la recherche et du ministre de l'économie et des finances précise les modalités de fonctionnement financier du centre et détermine notamment le rôle de l'agent comptable, nommé par arrêté du ministre de l'économie et des finances.

Art. 14. — Le contrôle de la gestion financière du centre est exercé sous l'autorité du ministre de l'économie et des finances par un contrôleur d'Etat. Un arrêté précisera, en tant que de besoin, les modalités d'application du présent article.

Les rapports du contrôleur d'Etat au ministre de l'économie et des finances sont adressés au ministre de l'industrie et de la recherche. Le rapport annuel est également communiqué au conseil d'administration.

Art. 15. — Les opérations du centre sont soumises au contrôle de la Cour des comptes.

TITRE II

Le conseil des applications spatiales.

Art. 16. — Il est créé, auprès du ministre de l'industrie et de la recherche, un conseil des applications spatiales.

Ce conseil, à caractère consultatif, comprend :

a) A titre de membres de droit : le délégué général à la recherche scientifique et technique, qui assure la vice-présidence, le président du conseil d'administration du centre national d'études spatiales, et le commissaire du Gouvernement auprès de cet établissement ;

b) Huit membres qualifiés en matière d'applications spatiales, représentant respectivement les ministres des affaires étrangères, de l'économie et des finances, de la défense, de l'industrie et de la recherche, et les secrétaires d'Etat aux transports, aux universités et aux départements et territoires d'outre-mer et aux postes et télécommunications ;

c) Six à huit personnalités scientifiques ou techniques choisies par le ministre de l'industrie et de la recherche.

Les membres du conseil autres que les membres de droit sont nommés par arrêté du ministre de l'industrie et de la recherche pour une durée de quatre ans. Le conseil est renouvelable par moitié tous les deux ans. Lors des premières désignations, la moitié des membres seront nommés pour deux ans.

Le président du conseil des applications spatiales est choisi par le ministre de l'industrie et de la recherche parmi les membres du conseil.

Le conseil se réunit sur convocation de son président au moins deux fois par an. Il pourra, en tant que de besoin, consulter des personnalités ou des experts, créer des comités ou des groupes de travail consultatifs.

Les membres bénéficient du remboursement des frais de déplacement ou de séjour effectivement supportés par eux à l'occasion des réunions du conseil, sur la base des taux applicables aux fonctionnaires appartenant au groupe I, dans les conditions prévues par le décret susvisé du 10 août 1966.

Art. 17. — Le conseil des applications spatiales est chargé :

D'émettre des avis et des propositions sur la politique de développement des applications spatiales et ses répercussions ;

De proposer les études et développements adéquats ;

De formuler des recommandations sur la mise en place des moyens nécessaires à l'exploitation de ces applications, et sur l'harmonisation des dépenses de recherche entre les différents secteurs concernés par les applications spatiales.

La préparation des travaux du conseil des applications spatiales est assurée par le centre national d'études spatiales.

TITRE III

Dispositions finales.

Art. 18. — Le décret n° 62-153 du 10 février 1962, pris pour l'application de la loi n° 61-1382 du 19 décembre 1961, relatif au fonctionnement administratif et financier du centre national d'études spatiales, modifié par le décret du 14 février 1968 et par le décret n° 68-853 du 25 septembre 1968, ainsi que le décret du 7 janvier 1959, relatif à la création d'un comité des recherches spatiales, modifié par le décret n° 61-703 du 3 juillet 1961, sont abrogés.

Art. 19. — Le Premier ministre, le ministre des affaires étrangères, le ministre de l'économie et des finances, le ministre de la défense, le ministre de l'industrie et de la recherche et le secrétaire d'Etat aux postes et télécommunications sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 27 janvier 1976.

VALÉRY GISCARD D'ESTAING.

Par le Président de la République :

Le Premier ministre,
JACQUES CHIRAC.

Le ministre de l'industrie et de la recherche,
MICHEL D'ORNANO.

Le ministre des affaires étrangères,
JEAN SAUVAGNARGUES.

Le ministre de l'économie et des finances,
JEAN-PIERRE FOURCADE.

Le ministre de la défense,
YVON BOURGES.

Le secrétaire d'Etat aux postes et télécommunications,
NORBERT SÉGARD.

Décret n° 77-978 du 22 août 1977 modifiant le décret n° 76-105 du 27 janvier 1976 relatif au centre national pour l'exploitation des océans et à l'organisation de la recherche océanologique.

Le Président de la République,

Sur le rapport du Premier ministre et du ministre de l'industrie, du commerce et de l'artisanat,

Vu le décret n° 76-105 du 27 janvier 1976 relatif au centre national pour l'exploitation des océans et à l'organisation de la recherche océanologique ;

Vu le décret n° 77-431 du 25 avril 1977 relatif aux attributions du Premier ministre en matière de recherche ;

Vu le décret n° 77-445 du 29 avril 1977 relatif aux attributions du secrétaire d'Etat auprès du Premier ministre (Recherche) ;

Vu le décret n° 77-474 du 6 mai 1977 relatif aux attributions du ministre de l'industrie, du commerce et de l'artisanat ;

Le Conseil d'Etat (section des travaux publics) entendu,

Décrète :

Art. 1er. — Les quatre premiers alinéas de l'article 17 du décret susvisé du 27 janvier 1976 sont abrogés et remplacés par les dispositions suivantes :

« Il est créé auprès du ministre chargé de la recherche et du ministre de l'industrie, du commerce et de l'artisanat un conseil de la recherche océanologique.

« Deux représentants du personnel du bureau désignés au sein de celui-ci sur des listes de présentation établies par les organisations syndicales ou professionnelles les plus représentatives, l'un parmi les ingénieurs ou cadres assimilés, l'autre parmi les agents d'exécution ou de maîtrise ;

« Quatre personnalités choisies en raison de leur compétence. »

Art. 2. — Le troisième alinéa de l'article 6 du décret du 23 octobre 1959 est remplacé par les dispositions suivantes :

« Le conseil d'administration désigne en son sein, dès sa nomination et après chaque renouvellement, un président suppléant chargé, en cas d'absence ou d'empêchement du président du conseil d'administration, de remplir les fonctions de ce dernier.

« Le conseil d'administration désigne, en outre, un secrétaire qui peut être pris hors de son sein. Il peut également constituer dans son sein un comité de direction dont il fixe la composition. »

Art. 3. — Le premier alinéa de l'article 7 du décret du 23 octobre 1959 est remplacé par les dispositions suivantes :

« Les membres du conseil d'administration sont nommés par décret pris sur le rapport du ministre chargé des mines. La durée du mandat des administrateurs est de trois ans. »

Art. 4. — L'article 10 du décret du 23 octobre 1959 est remplacé par les dispositions suivantes :

« Dans le cadre des programmes généraux définis par le conseil d'administration, les programmes d'opération afférents soit à une zone géographiquement déterminée, soit à un secteur d'activité technique, peuvent être suivis par des comités constitués par le conseil d'administration selon des modalités approuvées par le ministre chargé des mines. »

Art. 5. — Le premier alinéa de l'article 16 du décret du 23 octobre 1959 est remplacé par les dispositions suivantes :

« Le directeur général du Bureau de recherches géologiques et minières est nommé sur proposition du conseil d'administration par décret pris sur le rapport du ministre chargé des mines. »

Art. 6. — Le ministre délégué à l'économie et aux finances et le ministre de l'industrie, du commerce et de l'artisanat sont chargés, chacun en ce qui le concerne, de l'application du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 22 août 1977.

RAYMOND BARRE.

Par le Premier ministre :

Le ministre de l'industrie, du commerce et de l'artisanat,

RENÉ MONORY.

Le ministre délégué à l'économie et aux finances,

ROBERT BOULIN.

Décret n° 77-977 du 22 août 1977 modifiant le décret n° 76-104 du 27 janvier 1976 relatif au centre national d'études spatiales et à l'organisation de la recherche spatiale.

Le Président de la République,

Sur le rapport du Premier ministre et du ministre de l'industrie, du commerce et de l'artisanat,

Vu le décret n° 76-104 du 27 janvier 1976 relatif au centre national d'études spatiales et à l'organisation de la recherche spatiale ;

Vu le décret n° 77-431 du 25 avril 1977 relatif aux attributions du Premier ministre en matière de recherche ;

Vu le décret n° 77-445 du 29 avril 1977 relatif aux attributions du secrétaire d'Etat auprès du Premier ministre (Recherche) ;

Vu le décret n° 77-474 du 6 mai 1977 relatif aux attributions du ministre de l'industrie, du commerce et de l'artisanat ;

Le Conseil d'Etat (section des travaux publics) entendu,

Décrète :

Art. 1er. — Les deux derniers alinéas de l'article 10 du décret susvisé du 27 janvier 1976 sont abrogés et remplacés par les dispositions suivantes :

« Les membres de ce comité, au nombre maximum de douze, sont nommés par arrêté conjoint du ministre chargé de la recherche et du ministre de l'industrie, du commerce et de l'artisanat après avis du secrétaire d'Etat aux universités.

« Le président du comité est nommé par arrêté conjoint du ministre chargé de la recherche et du ministre de l'industrie, du commerce et de l'artisanat sur proposition du président du centre national d'études spatiales. »

Art. 2. — Les quatre premiers alinéas de l'article 16 sont abrogés et remplacés par les dispositions suivantes :

« Il est créé, auprès du ministre chargé de la recherche et du ministre de l'industrie, du commerce et de l'artisanat, un conseil des applications spatiales.

« Ce conseil, à caractère consultatif, comprend :

« *a*) A titre de membres de droit : le délégué général à la recherche scientifique et technique, qui assure la vice-présidence, le président du conseil d'administration du centre national d'études spatiales et le commissaire du Gouvernement auprès de cet établissement ;

« *b*) Huit membres qualifiés en matière d'applications spatiales représentant respectivement les ministres des affaires étrangères, de l'économie et des finances, de la défense, de l'industrie, du commerce et de l'artisanat et les secrétaires d'Etat aux transports, aux universités, aux départements et territoires d'outre-mer et aux postes et télécommunications ;

« *c*) Six à huit personnalités scientifiques ou techniques choisies conjointement par le ministre chargé de la recherche et par le ministre de l'industrie, du commerce et de l'artisanat.

« Les membres du conseil autres que les membres de droit sont nommés par arrêté conjoint du ministre chargé de la recherche et du ministre de l'industrie, du commerce et de l'artisanat pour une durée de quatre ans. Le conseil est renouvelable par moitié tous les deux ans. Lors des premières désignations, la moitié des membres seront nommés pour deux ans.

« Le président du conseil des applications spatiales est choisi conjointement par le ministre chargé de la recherche et par le ministre de l'industrie, du commerce et de l'artisanat parmi les membres du conseil. »

Art. 3. — Le Premier ministre et le ministre de l'industrie, du commerce et de l'artisanat sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 22 août 1977

VALÉRY GISCARD D'ESTAING.

Par le Président de la République :

Le Premier ministre,

RAYMOND BARRE.

Le ministre de l'industrie, du commerce et de l'artisanat,

RENÉ MONORY.

MINISTERE DE L'INDUSTRIE

Décret n° 79-468 du 13 juin 1979 modifiant le décret n° 76-104 du 27 janvier 1976 relatif au centre national d'études spatiales.

Le Président de la République,

Sur le rapport du Premier ministre,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un centre national d'études spatiales ;

Vu le décret n° 76-104 du 27 janvier 1976 relatif au centre national d'études spatiales et à l'organisation de la recherche spatiale, modifié par le décret n° 77-977 du 22 août 1977 ;

Le Conseil d'Etat (section des travaux publics) entendu,

Décrète :

Art. 1er. — Les deux premiers alinéas de l'article 1er du décret du 27 janvier 1976 susvisé sont remplacés par les dispositions suivantes :

« Le conseil d'administration du centre national d'études spatiales comprend, outre le président, treize membres :

« Le directeur du budget au ministère du budget ou son représentant nommément désigné ;

« Le directeur des affaires industrielles et internationales au secrétariat d'Etat aux postes et télécommunications ;

« Le directeur technique des engins au ministère de la défense ;

« Le secrétaire général de la défense nationale ou son représentant nommément désigné ;

« Le directeur général de Télédiffusion de France ;

« Le directeur général des relations culturelles, scientifiques et techniques au ministère des affaires étrangères ou son représentant nommément désigné ;

« Le directeur de la délégation générale à la recherche scientifique et technique ;

« Le directeur des relations économiques extérieures ;

« Cinq personnalités qualifiées en raison de leurs compétences dans le domaine d'activité du centre.

« Le président du conseil d'administration est nommé pour trois ans, par décret pris en conseil des ministres sur proposition du ministre de l'industrie. Son mandat est renouvelable.

« Les membres du conseil qui ne sont pas membres de droit sont nommés pour trois ans par décret pris sur le rapport du ministre de l'industrie. Leur mandat est renouvelable. Les membres décédés ou démissionnaires doivent être remplacés. Dans ce cas, le mandat des nouveaux membres expire à la date à laquelle aurait normalement pris fin celui de leurs prédécesseurs. »

Art. 2. — Le premier alinéa de l'article 2 du décret du 27 janvier 1976 susvisé est abrogé.

Art. 3. — Le dernier alinéa de l'article 3 du décret du 27 janvier 1976 susvisé est abrogé.

Art. 4. — L'article 4 du décret du 27 janvier 1976 susvisé est modifié de la façon suivante :

Les 7° et 8° du premier alinéa sont remplacés par :

« 7° Approbation des projets de marchés et conventions ;

« 8° Approbation des projets d'achats et de ventes d'immeubles, des constitutions de nantissements et d'hypothèques, des projets de baux et de location d'immeubles ; »

Les deux derniers alinéas sont remplacés par :

« Le conseil d'administration est consulté par le ministre de l'industrie sur les projets d'orientation de la politique spatiale française. Il peut en outre être consulté sur toute question de la compétence du centre.

« Le conseil peut, dans les limites qu'il détermine, autoriser le président à passer sans son approbation préalable les marchés et conventions. »

Art. 5. — Le titre II du décret du 25 janvier 1976 susvisé est abrogé.

Art. 6. — Le Premier ministre, le ministre des affaires étrangères, le ministre de la défense, le ministre du budget, le ministre de l'industrie, le ministre des transports, le secrétaire d'Etat aux postes et télécommunications et le secrétaire d'Etat auprès du Premier ministre (Recherche) sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 13 juin 1979.

VALÉRY GISCARD D'ESTAING.

Par le Président de la République :

Le Premier ministre,
RAYMOND BARRE.

Le ministre de l'industrie,
ANDRÉ GIRAUD.

Le ministre des affaires étrangères,
JEAN FRANÇOIS-PONCET.

Le ministre de la défense,
YVON BOURGES.

Le ministre du budget,
MAURICE PAPON.

Le ministre des transports,
JOËL LE THEULE.

Le secrétaire d'Etat aux postes et télécommunications,
NORBERT SÉGARD.

Le secrétaire d'Etat auprès du Premier ministre (Recherche),
PIERRE AIGRAIN.

Décret portant nomination de membres du conseil d'administration du centre national d'études spatiales.

Par décret en date du 13 juin 1979, sont nommés membres du conseil d'administration du centre national d'études spatiales en tant que personnalités qualifiées en raison de leurs compétences dans le domaine d'activité du centre :

M. Mittner (Roger), directeur de la météorologie nationale.

M. Esper (Philippe), délégué à l'action extérieure.

M. Laurent (Pierre), conseiller d'Etat.

M. Le Bars (Yvon), président directeur général de la Société Transpac.

Les personnalités qualifiées ci-dessus désignées sont nommées pour une durée de trois ans à compter de la date de publication du présent décret.

Modalités de fonctionnement financier du Centre national d'études spatiales.

Le ministre de l'économie, des finances et du budget et le ministre de l'industrie et de la recherche,

Vu la loi n° 61-1322 du 19 décembre 1961 instituant un Centre national d'études spatiales ;

Vu le décret n° 76-104 du 27 janvier 1976 relatif au Centre national d'études spatiales et à l'organisation de la recherche spatiale, modifié par les décrets n° 77-977 du 22 août 1977 et n° 79-468 du 13 juin 1979 ;

Vu le décret n° 62-1587 du 29 décembre 1962 portant règlement général sur la comptabilité publique ;

Vu le décret n° 64-486 du 23 mai 1964, modifié par le décret n° 71-153 du 22 février 1971, relatif aux régies de recettes et aux régies d'avances des organismes publics ;

Vu l'arrêté du 3 décembre 1969 relatif à la commission des marchés instituée auprès du Centre national d'études spatiales, modifié par les arrêtés des 12 mars 1971, 9 août 1973, 7 mars 1975 et 15 juillet 1976,

Arrêtent :

Art. 1er. — Le fonctionnement financier et comptable du Centre national d'études spatiales est assuré dans les conditions fixées par le décret du 29 décembre 1962 susvisé portant règlement général sur la comptabilité publique, selon les modalités définies ci-après.

Art. 2. — Un état de prévision de recettes et de dépenses est établi pour chaque exercice annuel commençant le 1er janvier.

L'état des prévisions fait apparaître sous deux sections distinctes les opérations relatives au fonctionnement et les opérations en capital.

Il est présenté selon la nomenclature budgétaire de l'établissement et la nomenclature comptable visée à l'article 216 du décret du 29 décembre 1962 susvisé.

La présentation de l'état de prévisions des recettes et des dépenses doit permettre un rapprochement avec les crédits inscrits à la loi de finances.

Art. 3. — Les opérations en capital s'exécutant sur plusieurs années font l'objet d'une présentation prévisionnelle du coût total et de l'échelonnement année par année des engagements et des paiements.

Art. 4. — L'état de prévision est préparé par le directeur général et délibéré par le conseil d'administration de façon à être soumis à l'approbation du ministre chargé de la recherche et du ministre chargé du budget, dans les conditions fixées par le décret du 27 janvier 1976 susvisé, au plus tard dans les quinze jours qui suivent la dernière séance du conseil d'administration précédant la date du début de l'exercice et, si possible, deux mois avant cette date.

Art. 5. — Si l'état n'est pas approuvé à l'ouverture de l'exercice, les opérations de recettes et de dépenses sont faites sur la base des prévisions de l'exercice précédent. Toutefois, s'il est nécessaire et après accord du contrôleur d'Etat, ces opérations peuvent être faites dans la limite des prévisions figurant à l'état non encore approuvé.

Art. 6. — Les décisions modificatives reconnues nécessaires sont délibérées et approuvées dans les mêmes formes que l'état annuel des prévisions.

Art. 7. — Le président du conseil d'administration a qualité d'ordonnateur principal. Il peut, sous sa responsabilité, déléguer une partie de ses pouvoirs au directeur général ou, après avis de celui-ci, à un ou plusieurs chefs de service placés sous l'autorité du directeur général. Le président du conseil d'administration désigne les ordonnateurs secondaires.

Art. 8. — Des avances peuvent être consenties dans les conditions fixées par l'ordonnateur, avec l'accord du contrôleur d'Etat, aux personnes chargées de missions pour le compte du centre ainsi qu'aux personnes, sociétés ou organismes mandatés par le centre pour opérer pour son compte.

Art. 9. — Les conditions générales de passation, de financement et de contrôle des marchés sont fixées par le conseil d'administration. Elles s'inspirent de la réglementation des marchés de l'Etat.

La composition et les règles de fonctionnement de la commission des marchés instituée auprès du C. N. E. S. sont fixées par arrêté du ministre chargé du budget et du ministre chargé de la recherche.

Art. 10. — Des agents comptables secondaires pourront être désignés par le directeur général sur proposition de l'agent comptable principal, conformément aux dispositions de l'article 195 du décret du 29 décembre 1962 susvisé.

Art. 11. — Des régies d'avances et des régies de recettes peuvent être instituées selon les dispositions du décret n° 64-486 susvisé.

Art. 12. — L'arrêté du 29 août 1963 relatif aux modalités de fonctionnement financier du Centre national d'études spatiales est abrogé.

Art. 13. — Le présent arrêté sera publié au *Journal officiel* de la République française.

Fait à Paris, le 7 février 1984.

Le ministre de l'industrie et de la recherche,

Pour le ministre et par délégation :

Le directeur de la politique générale de la recherche,

J.-F. THERY.

Le ministre de l'économie, des finances et du budget,

Pour le ministre et par délégation :

Par empêchement du directeur du budget :

Le sous-directeur,

E. RODOCANACHI.

MINISTERE DE L'INDUSTRIE ET DE LA RECHERCHE

Décret n° 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales.

Le Premier ministre,

Sur le rapport du ministre de l'industrie et de la recherche,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un Centre national d'études spatiales, et notamment son article 5 ;

Vu la loi n° 75-596 du 19 juillet 1975 portant diverses dispositions relatives à la réforme de la procédure civile, et notamment son article 7 ;

Vu la loi n° 82-610 du 15 juillet 1982 d'orientation et de programmation pour la recherche et le développement technologique de la France ;

Vu la loi n° 83-675 du 26 juillet 1983 modifiée relative à la démocratisation du secteur public, ensemble le décret n° 83-1160 du 26 décembre 1983 portant application de cette loi ;

Vu le décret n° 53-707 du 9 août 1953 modifié relatif au contrôle de l'Etat sur les entreprises publiques nationales et certains organismes ayant un objet d'ordre économique ou social ;

Vu le décret n° 55-733 du 26 mai 1955 modifié relatif au contrôle économique et financier de l'Etat ;

Vu le décret n° 59-587 du 29 avril 1959 relatif aux nominations aux emplois de direction de certains établissements publics, entreprises publiques et sociétés nationales, modifié par le décret n° 67-152 du 22 février 1967 ;

Vu le décret n° 62-1587 du 29 décembre 1962 portant règlement général sur la comptabilité publique ;

Le Conseil d'Etat (section des travaux publics) entendu,

Décrète :

TITRE Ier

ORGANISATION ET FONCTIONNEMENT DU CENTRE NATIONAL D'ÉTUDES SPATIALES

Art. 1er. — Le conseil d'administration du Centre national d'études spatiales comprend dix-huit membres :

1° Sept représentants de l'Etat, nommés par décret, dont :

Un représentant du Premier ministre ;
Un représentant du ministre chargé de l'économie ;
Un représentant du ministre chargé du budget ;
Un représentant du ministre chargé de la défense ;
Un représentant du ministre chargé des relations extérieures ;
Un représentant du ministre chargé de la recherche ;
Un représentant du ministre chargé des P. T. T. ;

2° Cinq membres choisis en raison de leur compétence dans le domaine d'activité du centre dont l'un dans le domaine de la télédiffusion, nommés par décret sur proposition des ministres chargés de l'industrie et de la recherche ;

3° Six membres élus par les salariés du centre dans les conditions prévues par le chapitre II du titre II de la loi du 26 juillet 1983 susvisée.

Le président du conseil d'administration est nommé parmi ces membres par décret pris en conseil des ministres sur proposition du conseil d'administration et sur le rapport des ministres chargés de l'industrie et de la recherche.

La durée des fonctions des membres du conseil d'administration est de cinq ans et ne peut être renouvelée plus de deux fois consécutives.

Le mandat des membres du conseil est exercé à titre gratuit.

Art. 2. — Les émoluments et indemnités du président sont fixés par décision conjointe des ministres chargés de l'industrie, de la recherche et du budget.

Art. 3. — Le conseil d'administration se réunit au moins quatre fois par an sur convocation de son président et examine toute question inscrite à l'ordre du jour par le président ou par le conseil statuant à la majorité simple.

En outre, le président réunit le conseil sur la demande des ministres chargés de l'industrie ou de la recherche. Le tiers des membres du conseil peut convoquer le conseil dans les conditions prévues au second alinéa de l'article 8 de la loi du 26 juillet 1983 susvisée.

Le conseil ne délibère valablement que si la moitié au moins de ses membres est présente. Si ce quorum n'est pas atteint, le conseil est à nouveau convoqué avec le même ordre du jour dans un délai maximum de vingt jours ; il délibère alors sans condition de quorum.

Les délibérations du conseil sont prises à la majorité des membres présents ou représentés ; en cas de partage des voix, celle du président est prépondérante.

Le lieu, la date et l'heure ainsi que l'ordre du jour sont portés au moins huit jours à l'avance à la connaissance des membres du conseil d'administration ainsi que du contrôleur d'Etat et du commissaire du gouvernement qui participent aux séances du conseil sans prendre part aux votes.

Le président peut appeler à participer aux séances avec voix consultative toute personne dont il juge la présence utile.

En application de l'avant-dernier alinéa de l'article 26 de la loi du 26 juillet 1983 susvisée, les représentants des salariés disposent chacun d'un crédit de dix-huit heures par mois pour l'exercice de leur mandat.

Art. 4. — Le conseil d'administration délibère sur les objets suivants :

1 Programme des activités et des investissements du centre ;

2 Plan d'organisation et de fonctionnement du centre ;

3 Etat annuel des prévisions de recettes et dépenses et, s'il y a lieu, états rectificatifs en cours d'année ;

4 Approbation du rapport annuel d'activité ;

5 Approbation du compte financier et de l'affectation des résultats de l'exercice ;

6 Approbation des emprunts à court, à moyen et à long terme ;

7 Les conditions générales de passation des contrats, conventions et marchés ainsi que le seuil au-dessus duquel ces marchés doivent lui être soumis ;

8 Les conditions dans lesquelles les dépenses peuvent être préfinancées avant la signature ou l'exécution d'un contrat ;

9 Approbation des projets d'achats et de ventes d'immeubles, des constitutions de nantissements et d'hypothèques ;

10 Prise, extension ou cession de participations financières ;

11 Acceptation ou refus des dons et legs ;

12 Régime de recrutement, d'emploi et de rémunération du personnel ;

13 Autorisation d'entreprendre, pour la mise en œuvre du programme de relations internationales de l'établissement, des négociations pouvant conduire à la conclusion d'arrangements administratifs internationaux.

Le conseil d'administration est consulté par les ministres chargés de l'industrie ou de la recherche sur les projets d'orientation de la politique spatiale française. Il peut en outre être consulté sur toute question de la compétence du centre.

En ce qui concerne le point 9, le conseil d'administration peut déléguer une partie de ses pouvoirs à son président. Celui-ci lui rend compte lors de sa plus prochaine séance des décisions qu'il a prises en vertu de cette délégation.

Art. 5. — Les délibérations du conseil d'administration portant sur les objets visés aux 3°, 5°, 6°, 8°, 10° et 12° de l'article précédent sont exécutoires sauf opposition des ministres chargés de l'industrie ou de la recherche ou de l'économie, des finances et du budget dans le mois suivant la réception du procès-verbal.

Les délibérations autres que celles ci-dessus visées sont de plein droit exécutoires si le commissaire du gouvernement prévu à l'article 10 du présent décret n'y a pas fait opposition dans les dix jours qui suivent soit la réunion du conseil s'il y a assisté, soit la réception du procès-verbal de la séance.

Dans le cas où il forme opposition, le commissaire du Gouvernement en réfère immédiatement aux ministres concernés qui doivent se prononcer dans le délai d'un mois. A défaut de décision expresse dans ce délai, la délibération du conseil d'administration est exécutoire.

Art. 6. — Par application de l'article 2 (4°) de la loi susvisée du 19 décembre 1961, le ministre des relations extérieures est associé à l'engagement, au déroulement et à la conclusion des négociations visées au 13° de l'article 4 ci-dessus.

Art. 7. — Le président du conseil d'administration représente le centre dans tous les actes de la vie civile, dans ses rapports avec les tiers et dans les relations internationales. Il assure l'exécution des délibérations du conseil d'administration.

Sous réserve des approbations nécessaires, il a notamment qualité pour :

Passer au nom du centre tous actes, contrats ou marchés ;

Procéder à toutes acquisitions, tout dépôt ou cession de brevet ou de licence ;

Représenter le centre en justice, transiger dans tous les litiges et compromettre en matière internationale ;

Il est l'ordonnateur principal des recettes et des dépenses. A ce titre il détermine l'emploi des fonds disponibles et le placement des réserves ; il procède à toutes acquisitions, aliénations et transferts de valeurs ainsi qu'à tous achats, ventes ou locations d'immeubles ; il contracte tous emprunts et constitue nantissement ou hypothèque. Le président du conseil d'administration désigne les ordonnateurs secondaires.

Il peut déléguer au directeur général, pour l'exécution de sa mission, une partie de ses pouvoirs.

Art. 8. — Le président du conseil d'administration est assisté d'un directeur général nommé par décret sur proposition des ministres chargés de l'industrie et de la recherche, le président du conseil d'administration ayant été préalablement consulté.

Le directeur général est chargé, selon les directives du président, de la mise en œuvre des programmes et des opérations confiées au centre, de la préparation et de l'exécution des décisions concernant l'organisation et le fonctionnement des services.

Il a autorité sur l'ensemble du personnel ; il conclut les contrats de travail, recrute et licencie les agents de toutes catégories.

Il préside le comité central d'établissement.

Il est chargé de la préparation des états annuels de prévision de recettes et de dépenses, des comptes et du bilan annuel du centre.

Il participe aux séances du conseil d'administration sans prendre part aux votes.

Les émoluments et indemnités du directeur général sont fixés par décision conjointe des ministres chargés de l'industrie, de la recherche et du budget.

Art. 9. — Le conseil d'administration du Centre national d'études spatiales est assisté d'un comité des programmes scientifiques qui a pour mission :

a) De faire rapport sur l'intérêt scientifique des programmes de recherche soumis au Centre national d'études spatiales et sur la capacité scientifique et technique des laboratoires qui proposent ces programmes ;

b) D'émettre des avis et des propositions sur les programmes de recherche propres au Centre national d'études spatiales ;

c) De formuler, compte tenu des moyens disponibles, toutes propositions utiles concernant le développement de la recherche spatiale en France et, conjointement, des autres disciplines liées à cette recherche.

Les membres de ce comité, au nombre maximum de douze, sont nommés par arrêté des ministres chargés de l'industrie et de la recherche, après avis du ministre chargé de l'éducation nationale.

Le président du comité est nommé par arrêté des ministres, chargés de l'industrie et de la recherche sur proposition du directeur général du Centre national d'études spatiales.

TITRE II

Dispositions administratives et financières

Art. 10. — Un commissaire du gouvernement, désigné par arrêté des ministres chargé de l'industrie et de la recherche, est placé auprès du Centre national d'études spatiales. Il peut à tout moment se faire communiquer toutes pièces, documents ou archives et procéder ou faire procéder à toute vérification. En cas d'empêchement, il peut se faire représenter aux séances du conseil d'administration par un fonctionnaire placé sous son autorité et nommément désigné.

Il informe les ministres intéressés des questions figurant à l'ordre du jour du conseil d'administration et des délibérations adoptées.

Art. 11. — Le Centre national d'études spatiales dispose des ressources suivantes :

Crédits budgétaires ouverts notamment aux budgets des ministères de l'industrie et de la recherche qui lui sont affectés ;

Fonds des contrats sur programme conclus avec des départements ministériels ou administrations y rattachées ;

Produits des emprunts ;

Rémunérations de services rendus ;

Dons et legs ;

Subventions publiques ou privées ;

Produits financiers et autres produits accessoires.

Art. 12. — Le rapport annuel sur l'activité du centre est adressé par le président du conseil d'administration aux ministres chargés de l'industrie et de la recherche qui le transmettent au Premier ministre et à tous les ministres intéressés.

Ce rapport est également transmis par les ministres chargés de l'industrie et de la recherche, au Parlement conformément à l'article 6 de la loi du 19 décembre 1961 susvisée.

Art. 13. — Un arrêté conjoint des ministres chargés de l'industrie, de la recherche et de l'économie, des finances et du budget précise les modalités de fonctionnement financier du centre et détermine notamment le rôle de l'agent comptable, nommé par arrêté conjoint des ministres chargés de l'industrie, de la recherche et du budget, sur proposition du président du conseil d'administration du centre. L'agent comptable assiste aux séances du conseil d'administration sans prendre part aux votes.

Art. 14. — Le contrôle de la gestion financière du centre est exercé par un contrôleur d'Etat placé sous l'autorité du ministre chargé du budget.

En tant que de besoin un arrêté des ministres chargés de l'industrie, de la recherche et de l'économie, des finances et du budget précise les modalités d'application du présent article.

Les rapports du contrôleur d'Etat au ministre du budget sont adressés aux ministres chargés de l'industrie et de la recherche. Le rapport annuel est également communiqué au conseil d'administration.

TITRE III

Dispositions finales

Art. 15. — Le décret n° 76-104 du 27 janvier 1976 modifié par les décrets n° 77-977 du 22 août 1977 et n° 79-468 du 13 juin 1979, relatifs au Centre national d'études spatiales et à l'organisation de la recherche spatiale est abrogé.

Art. 16. — Le ministre de l'économie, des finances et du budget, le ministre des relations extérieures, le ministre de la défense, le ministre délégué auprès du ministre de l'industrie et de la recherche, chargé des P. T. T., et le secrétaire d'Etat auprès du ministre de l'économie, des finances et du budget, chargé du budget, sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 28 juin 1984.

PIERRE MAUROY.

Par le Premier ministre :

Le ministre de l'industrie et de la recherche,
LAURENT FABIUS.

Le ministre de l'économie, des finances et du budget,
JACQUES DELORS.

Le ministre des relations extérieures,
CLAUDE CHEYSSON.

Le ministre de la défense,
CHARLES HERNU.

Le ministre délégué auprès du ministre de l'industrie et de la recherche, chargé des P.T.T.,
LOUIS MEXANDEAU.

Le secrétaire d'Etat auprès du ministre de l'économie, des finances et du budget, chargé du budget,
HENRI EMMANUELLI.

MINISTÈRE DES P.T.T.

Décret n° 86-129 du 28 janvier 1986 portant organisation de l'administration centrale du ministère des P.T.T.

Le Président de la République,

Sur le rapport du Premier ministre, du ministre de l'économie, des finances et du budget, du ministre de l'intérieur et de la décentralisation, du ministre du redéploiement industriel et du commerce extérieur, du ministre des P.T.T. et du secrétaire d'Etat auprès du Premier ministre, chargé de la fonction publique et des simplifications administratives,

Vu la loi n° 45-01 du 24 novembre 1945 relative aux attributions des ministres et à l'organisation des ministères, modifiée par le décret n° 59-178 du 22 janvier 1959 relatif aux attributions des ministres ;

Vu le décret n° 66-811 du 27 octobre 1966 portant transfert au ministre des postes et télécommunications d'attributions du ministre d'Etat en matière de postes et télécommunications dans les territoires d'outre-mer ;

Vu le décret n° 82-389 du 10 mai 1982 relatif aux pouvoirs du commissaire de la République dans les départements, et notamment son article 8 ;

Vu le décret n° 82-390 du 10 mai 1982 relatif aux pouvoirs du commissaire de la République de région, et notamment son article 7 ;

Vu le décret n° 82-636 du 21 juillet 1982 précisant l'organisation des services des P.T.T., pris en application de l'article 8 du décret n° 82-389 du 10 mai 1982 et de l'article 7 du décret n° 82-390 du 10 mai 1982 relatifs aux commissaires de la République de département et de région ;

Vu le décret n° 85-1212 du 20 novembre 1985 relatif aux attributions du ministre des P.T.T. ;

Vu l'avis en date du 18 décembre 1985 du Conseil supérieur des P.T.T. ;

Vu l'avis en date du 19 décembre 1985 du comité technique paritaire ministériel du ministère des P.T.T. ;

Décrète :

Art. 1er. — L'administration centrale du ministère des P.T.T. comprend, outre le bureau du cabinet, le service de l'information et de la communication et le service de défense et de sécurité civile, directement rattachés au cabinet du ministre :

1. La délégation générale à la stratégie ;

2. La direction des affaires communes, personnel et affaires sociales, budget et comptabilité ;

3. La direction générale des postes qui comprend :

La direction de la production ;
La direction de la promotion ;
La direction financière ;
La direction de la logistique ;
La direction de la prospective et des affaires internationales ;
Le service du personnel ;
Le service de sécurité ;

4. La direction générale des télécommunications qui comprend :

La direction des affaires commerciales et télématiques ;
La direction des affaires industrielles et internationales ;
La direction de la production ;
La direction des programmes et des affaires financières ;
Le service de la prospective et des études économiques ;
Le service du personnel ;
Le service de sécurité ;

5. Le comité des enseignements supérieurs.

Le ministre des P.T.T. assure enfin, pour la part qui relève de ses attributions, la tutelle de l'établissement public de diffusion T.D.F.

L'inspection générale, organe supérieur de contrôle des services, placée sous l'autorité directe du ministre, fait organiquement partie de l'administration centrale.

Art. 2. — La délégation générale à la stratégie relève directement de l'autorité du ministre.

La délégation générale à la stratégie conduit son action en relation avec la direction générale des postes, la direction générale des télécommunications, la direction des affaires communes et T.D.F.

Elle étudie et propose au ministre les orientations stratégiques du ministère des P.T.T., y compris dans le domaine international, et en suit la mise en œuvre. Ces orientations serviront de base à l'élaboration des chartes de gestion.

A ce titre, elle participe à l'élaboration et au suivi des chartes de gestion des directions générales, des filiales et organismes qui leur sont rattachés et de T.D.F. Ces chartes de gestion fixent le cadre d'action, les objectifs de chacune des entités du service public.

Dans son domaine de responsabilité, elle conduit une réflexion sur la complémentarité entre la poste, les télécommunications et la télédiffusion.

Elle élabore et fait respecter les principes généraux de la réglementation des P.T.T., veille à leur application et en propose l'évolution, notamment en fonction des données internationales. Lui sont rattachés les services chargés d'instruire les demandes d'autorisation, d'agrément et d'admission des installateurs. Elle intervient dans les organismes gérant le spectre des fréquences.

Elle coordonne la représentation des P.T.T. dans les instances nationales et internationales, notamment celles compétentes en matière de réglementation et de normes techniques.

Elle exerce la tutelle des industries du secteur télécommunications, informatique, bureautique. Elle répartit les dotations en capital et subventions, dans le cadre de l'enveloppe arrêtée par la loi de finances, et instruit les contrats de plan des entreprises de ce secteur, en liaison avec la direction générale de l'industrie du ministère du redéploiement industriel et du commerce extérieur.

Elle exerce également les responsabilités du ministère des P.T.T. dans les divers organismes du secteur télécommunications, informatique et bureautique.

Elle participe à l'élaboration des budgets des organismes de la filière électronique qui font l'objet de financement par le ministère des P.T.T.

Elle s'assure que l'action des filiales du ministère des P.T.T. s'inscrit dans le cadre des orientations stratégiques décidées par le Gouvernement.

En tant que de besoin, pour l'exercice de ses attributions, elle fait appel aux services des centres de recherche des P.T.T.

Elle définit les moyens nécessaires à son fonctionnement, élabore son budget et en assure l'exécution.

Le délégué général à la stratégie est nommé en conseil des ministres.

Art. 3. — La direction des affaires communes relève directement de l'autorité du ministre.

Elle est compétente dans les domaines du personnel, des affaires sociales, du budget, de la comptabilité et de l'entretien des matériels de transport automobile.

Elle a une mission générale d'élaboration, d'animation, de coordination, de conseil et de contrôle dans les domaines relevant de sa compétence. Cette dernière mission s'exerce notamment par l'intervention des services comptables et de services de contrôle spécialisés.

Pour son secteur de responsabilité ou pour des questions communes à plusieurs directions ou services, elle assure la représentation unitaire du ministère des P.T.T. auprès des autres administrations, notamment auprès des ministères chargés de la fonction publique et du budget, ainsi qu'auprès des organismes ou autorités à caractère national ou international.

Elle conduit son action en relation avec la délégation générale à la stratégie et, compte tenu des besoins qu'elles expriment, avec la direction générale des postes et la direction générale des télécommunications.

Dans ce cadre, dans le respect des dispositions statutaires applicables à la fonction publique d'Etat et dans le respect de l'unité des P.T.T., elle est responsable du statut du personnel et définit les règles générales applicables en matière de recrutement, d'avancement, de mutations, de rémunérations, de discipline et de pensions. Elle s'assure de leur bonne application.

La mise en œuvre de la gestion du personnel relève de la responsabilité des directions générales ou autres services utilisateurs. Toutefois, la direction des affaires communes gère directement certains personnels.

Elle autorise le recrutement des personnels appartenant à des corps répartis de façon non prépondérante dans l'une ou l'autre des directions générales à partir des besoins fixés par les directions générales et les services utilisateurs.

Elle conduit une réflexion sur les problèmes généraux de politique de personnel et de formation. Elle a un rôle de coordination pour les questions de formation communes à l'ensemble des P.T.T.

Elle impulse et contrôle les actions en matière d'hygiène et de sécurité et définit l'action médicale en liaison avec le service du médecin en chef des P.T.T. et les services de sécurité des directions générales.

Elle a une fonction de documentation. A ce titre, elle a, en particulier, la responsabilité des bibliothèques et de la documentation juridique.

Elle comprend un service chargé des affaires sociales. Ce service impulse, conduit et contrôle l'action sociale. Il a la tutelle des associations de personnel de ce secteur. Son action s'exerce notamment dans les domaines de l'assistance au personnel, de l'aide au logement, à l'enfance et à la jeunesse, des restaurants administratifs, des coopératives, du sport et des loisirs.

La direction des affaires communes assure la préparation des documents budgétaires soumis au Parlement et prépare les décisions réglementaires nécessaires à l'exécution du budget.

Elle est chargée de la réglementation, de la description et du contrôle des opérations budgétaires et comptables ainsi que de l'information des autorités de gestion et de contrôle. A ce titre, le directeur des affaires communes a notamment autorité sur l'agent comptable central.

Elle est responsable des affaires juridiques et contentieuses pour les secteurs d'activité relevant de son domaine de compétence et pour des questions communes à plusieurs directions ou services des P.T.T.

Elle est compétente pour les principes applicables en matière d'organisation et de fonctionnement des centres et ateliers d'entretien des matériels de transport automobile.

Elle définit et met en œuvre les applications informatiques liées à son domaine de responsabilité.

Elle définit les moyens nécessaires à son fonctionnement, élabore son budget et en assure l'exécution.

Le directeur des affaires communes a autorité sur les chefs des services extérieurs qui lui sont rattachés, en particulier les services régionaux de comptabilité.

Art. 4. — La direction générale des postes relève directement de l'autorité du ministre.

Elle définit la politique générale des services postaux et financiers et détermine les moyens nécessaires à leur fonctionnement. Elle élabore, négocie et exécute les chartes de gestion et le budget de la poste et propose les moyens de financement correspondants. Elle gère les moyens mis à sa disposition par la loi de finances.

Le directeur général des postes dirige l'activité de l'ensemble des directions et services de la direction générale des postes.

Il a délégation du ministre des P.T.T. pour l'exercice de ses compétences dans les filiales de l'Etat et les organismes dont l'activité principale relève du domaine de la poste et des services financiers.

Il a autorité sur les chefs des services extérieurs de la poste sous réserve des pouvoirs respectivement dévolus aux commissaires de la République de département et de région et notamment de l'application des articles 16 du décret n° 82-389 et 15 du décret n° 82-390 du 10 mai 1982 susvisés.

Il peut confier à un directeur la mission de coordonner l'action de plusieurs directions ou services.

Art. 5. — La direction de la production de la direction générale des postes est chargée, en collaboration avec la direction de la promotion, de l'organisation et du fonctionnement des services de la poste.

Elle assure l'exploitation des produits, gère les centres de traitement ainsi que les points de contact avec le public et organise les diverses chaînes d'exploitation. Elle contrôle la qualité des prestations fournies et suit l'évolution des résultats d'exploitation.

Dans le cadre de la politique informatique de la direction générale des postes, elle met en œuvre les applications informatiques liées à la production.

Art. 6. — La direction de la promotion de la direction générale des postes élabore et met en œuvre la politique de développement des prestations et de relations avec les usagers.

En collaboration avec la direction de la production et la direction financière, elle détermine la gamme des prestations offertes, organise les études de marché et la promotion des produits.

Elle détermine, en liaison avec la direction de la production et la direction financière, compte tenu des orientations proposées par la délégation générale à la stratégie et figurant aux chartes de gestion, les principes de la politique tarifaire.

Elle est chargée de l'organisation et de l'animation des réseaux d'accueil et de contact et des relations commerciales avec les diverses catégories d'usagers.

Art. 7. — En liaison avec les autres directions de la direction générale des postes, la direction financière est chargée du plan, des programmes, du budget, de la comptabilité de gestion ainsi que des études économiques et statistiques et des affaires juridiques et contentieuses.

Elle étudie les mesures de nature à assurer l'équilibre économique de la poste.

Elle est responsable des moyens de financement, contrôle la gestion du portefeuille et assure la gestion du fonds de roulement et des participations.

Elle définit et met en œuvre, pour l'ensemble de la poste, l'organisation et le contrôle de la gestion.

Elle a la responsabilité des affaires juridiques et contentieuses pour les services relevant de la direction générale des postes.

Dans le cadre de la politique informatique de la direction générale des postes, elle met en œuvre les applications informatiques liées à la gestion.

Art. 8. — Sur la base des spécifications définies par les directions de la direction générale des postes et, dans certains domaines, par les autres directions et services, la direction de la logistique de la direction générale des postes est chargée de la mise en œuvre des programmes d'équipement.

A la demande et en collaboration avec les autres directions, elle est chargée de l'acquisition, la construction, la location, l'aménagement et l'entretien des immeubles autres que ceux relevant de la direction générale des télécommunications.

Elle acquiert et met en place les matériels et fournitures ainsi définis.

Elle assure la maintenance des installations et des matériels.

Elle est compétente en matière de législation et de réglementation générale d'opérations immobilières et de marchés.

Elle est chargée de l'étude, de l'acquisition et de l'entretien des matériels de transport dépendant de la direction générale des postes.

Art. 9. — En liaison avec la direction de la production, la direction de la promotion et la direction de la logistique, la direction de la prospective et des affaires internationales est responsable des études et projets de recherche et de développement. Elle est chargée des relations avec les industries concernées.

Elle définit la politique informatique de la direction générale des postes et coordonne sa mise en œuvre.

Elle traite, en tant que de besoin en liaison avec la délégation générale à la stratégie, de toutes les questions de coopération internationale et d'exportation des équipements de la poste ; elle dirige et coordonne l'action des services compétents dans ces domaines.

Elle assure l'exploitation des relations postales avec les pays étrangers.

Art. 10. - Le service du personnel de la direction générale des postes est chargé de définir les caractéristiques fonctionnelles des différents emplois de la poste et, à ce titre, collabore à l'élaboration des statuts et des règles de personnel.

Il assure, dans le respect des règles définies par la direction des affaires communes, et dans les conditions précisées à l'article 3, 7e alinéa, du présent décret, la gestion des moyens en personnel de la poste. L'essentiel de cette responsabilité est exercé de façon déconcentrée.

Il est responsable de la formation des personnels de la poste. Pour les personnels supérieurs, il exerce cette responsabilité en liaison avec le comité des enseignements supérieurs.

Il est chargé des études d'organisation relatives aux services relevant de la direction générale des postes.

Art. 11. - Le service de sécurité de la direction générale des postes définit les contrôles administratifs et techniques destinés à garantir la protection des bâtiments et des équipements, ainsi que la sécurité des envois confiés à la poste, des fonds et des valeurs, des fichiers et des procédures.

Il procède ou fait procéder aux études nécessaires à l'accomplissement de sa mission. Il propose les règles à observer et en contrôle l'application.

Il définit les mesures propres à renforcer la protection des personnels de la poste et coordonne l'action des directions et services de la direction générale des postes dans ce domaine. Il intervient, si nécessaire, auprès des ministères et organismes compétents.

Dans le domaine de la sécurité, il coordonne ainsi l'action de l'ensemble des services de la direction générale des postes.

Il est le correspondant du service de défense et de sécurité civile des P.T.T.

Art. 12. - La direction générale des télécommunications relève directement de l'autorité du ministre.

Elle définit la politique générale des télécommunications et détermine les moyens nécessaires à leur fonctionnement. Elle élabore, négocie et exécute les chartes de gestion et le budget des télécommunications et propose les moyens de financement correspondants. Elle gère les moyens mis à sa disposition par la loi de finances.

Le directeur général des télécommunications dirige l'activité de l'ensemble des directions et services de la direction générale des télécommunications.

Il a délégation du ministre des P.T.T. pour l'exercice de ses compétences dans les filiales de l'Etat et les organismes dont l'activité principale relève du domaine des télécommunications et de la télédiffusion.

Il a autorité sur les chefs des services extérieurs des télécommunications sous réserve des pouvoirs respectivement dévolus aux commissaires de la République de département et de région et notamment de l'application des articles 16 du décret n° 82-389 et 15 du décret n° 82-390 du 10 mai 1982 susvisés.

Il peut confier à un ou plusieurs directeurs la mission de coordonner l'action de plusieurs directions ou services.

Art. 13. - La direction de la production de la direction générale des télécommunications est chargée de la définition, de l'ingénierie, de la mise en œuvre et de la maintenance des équipements et des bâtiments pour lesquels elle passe, sous réserve des délégations consenties et à l'exception des marchés d'études de nouveau matériel et de prototypes, les conventions et les marchés nécessaires. Elle est chargée de l'étude, de l'acquisition et de l'entretien des matériels de transport dépendant de la direction générale des télécommunications.

Elle est chargée de l'acheminement du trafic et de l'exploitation technique, automatique et manuelle du réseau de télécommunications.

Elle règle et coordonne l'action des directions régionales des télécommunications et des services spéciaux qui lui sont rattachés.

Art. 14. - La direction des affaires commerciales et télématiques de la direction générale des télécommunications est chargée de proposer et mettre en œuvre la politique commerciale et télématique des télécommunications.

Elle élabore, compte tenu des orientations proposées par la délégation générale à la stratégie et figurant dans les chartes de gestion, la politique tarifaire des télécommunications.

Elle a la responsabilité des affaires juridiques et contentieuses pour les services relevant de la direction générale des télécommunications.

Elle oriente et coordonne l'action des services compétents et passe, sous réserve des délégations consenties, les marchés nécessaires à l'exécution de sa mission.

Art. 15. - La direction des affaires industrielles et internationales de la direction générale des télécommunications définit, avec la direction de la production, la politique d'achat des télécommunications et propose les éléments de la politique industrielle des télécommunications.

Elle assure le contrôle technique des équipements de télécommunications.

Elle contrôle les prix des matières, fournitures et services acquis par les télécommunications.

Elle est chargée de la répartition des crédits d'études de nouveau matériel et de prototypes pour lesquels elle passe, sous réserve des délégations consenties, les marchés nécessaires.

Sous l'autorité du directeur général des télécommunications, elle oriente l'action du Centre national d'études des télécommunications.

Elle traite, en liaison avec la délégation générale à la stratégie, de toutes les questions de coopération internationale et d'exportation des équipements des télécommunications ; elle dirige et coordonne l'action des services compétents dans ces domaines et passe, sous réserve des délégations consenties, les marchés nécessaires.

Elle assure l'exploitation des télécommunications avec les pays étrangers.

Art. 16. - La direction des programmes et des affaires financières de la direction générale des télécommunications est chargée du plan, des programmes, du budget et des affaires financières.

Elle étudie les mesures de nature à réaliser l'équilibre financier de la direction générale des télécommunications.

Elle est responsable des moyens de financement et assure la gestion du fonds de roulement et des participations.

Elle définit et met en œuvre, pour l'ensemble des télécommunications, l'organisation et le contrôle de la gestion.

Elle définit la politique d'informatique de gestion de la direction générale des télécommunications et coordonne sa mise en œuvre.

Art. 17. - Le service de la prospective et des études économiques de la direction générale des télécommunications est chargé de la prospective et des études économiques.

Art. 18. - Le service du personnel de la direction générale des télécommunications est chargé de définir les caractéristiques fonctionnelles des différents emplois des télécommunications et, à ce titre, collabore à l'élaboration des statuts et des règles de personnel.

Il assure, dans le respect des règles définies par la direction des affaires communes, et dans les conditions précisées à l'article 3, 7e alinéa, du présent décret, la gestion des moyens en personnel des télécommunications. L'essentiel de cette responsabilité est exercé de façon déconcentrée.

Il est responsable de la formation des personnels des télécommunications. Pour les personnels supérieurs, il exerce cette responsabilité en liaison avec le comité des enseignements supérieurs.

Il est chargé des études d'organisation relatives aux services relevant de la direction générale des télécommunications.

Art. 19. - Le service de sécurité de la direction générale des télécommunications effectue les contrôles administratifs et techniques destinés à garantir la protection des bâtiments et des équipements et la préservation des produits et des fonds des télécommunications.

Il procède aux études de protection et de sécurisation du réseau des télécommunications et contrôle l'application des mesures prises dans ce domaine.

Il définit les moyens d'urgence, administratifs et techniques, à mettre en œuvre en cas de sinistre, le recours éventuel à T.D.F. et aux autres départements ministériels intervenant par l'intermédiaire du service de défense et de sécurité civile des P.T.T.

Il définit les mesures propres à renforcer la protection des personnels des télécommunications et coordonne l'action des directions et services de la direction générale des télécommunications dans ce domaine. Il intervient, si nécessaire, auprès des ministères et organismes compétents.

Il coordonne l'action de l'ensemble des services des télécommunications dans le domaine de la sécurité.

Art. 20. - Le comité des enseignements supérieurs comprend, sous la présidence du ministre ou de son représentant, le directeur des affaires communes, le directeur général des postes et le directeur général des télécommunications. Les directeurs des enseignements supérieurs participent aux travaux de ce comité.

Le comité des enseignements supérieurs est chargé de définir les orientations générales des enseignements supérieurs des P.T.T. et de fixer leurs objectifs. Il examine les propositions budgétaires et les programmes d'enseignement.

Art. 21. - Les attributions des directions et services seront précisées, en tant que de besoin, par arrêtés du ministre des P.T.T.

Art. 22. - Le décret n° 71-609 du 20 juillet 1971 modifié portant organisation de l'administration centrale du ministère des postes et télécommunications est abrogé.

Art. 23. - Le Premier ministre, le ministre de l'économie, des finances et du budget, le ministre de l'intérieur et de la décentralisation, le ministre du redéploiement industriel et du commerce extérieur, le ministre des P.T.T. et le secrétaire d'Etat auprès du Premier ministre, chargé de la fonction publique et des simplifications administratives, sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 28 janvier 1986.

FRANÇOIS MITTERRAND

Par le Président de la République :

Le Premier ministre,
LAURENT FABIUS

Le ministre des P.T.T.,
LOUIS MEXANDEAU

Le ministre de l'économie, des finances et du budget,
PIERRE BÉRÉGOVOY

Le ministre de l'intérieur et de la décentralisation,
PIERRE JOXE

Le ministre du redéploiement industriel et du commerce extérieur,
ÉDITH CRESSON

Le secrétaire d'Etat auprès du Premier ministre, chargé de la fonction publique et des simplifications administratives,
JEAN LE GARREC

MINISTÈRE DE L'ÉDUCATION NATIONALE

Arrêté du 20 janvier 1986 relatif aux statuts de l'université de Rouen

Par arrêté du secrétaire d'Etat auprès du ministre de l'éducation nationale, chargé des universités, en date du 20 janvier 1986, les statuts de l'université de Rouen sont arrêtés (1).

(1) Les statuts peuvent être consultés au siège de l'établissement et au secrétariat d'Etat chargé des universités, 61-65, rue Dutot, à Paris (15e).

Arrêté du 21 janvier 1986 fixant les conditions d'admission à l'Ecole normale supérieure de Cachan

Le ministre de l'éducation nationale,

Vu le décret n° 85-788 du 24 juillet 1985 relatif aux écoles normales supérieures ;

Vu le décret n° 85-789 du 24 juillet 1985 portant création d'établissements publics à caractère scientifique, culturel et professionnel ;

Vu le décret n° 60-1289 du 21 novembre 1960 relatif au recrutement des élèves et à la durée de la scolarité à l'Ecole normale supérieure de l'enseignement technique ;

Vu le décret n° 78-1101 du 21 novembre 1978 relatif à l'aptitude physique des candidats aux concours d'entrée dans les écoles normales supérieures ;

Vu l'arrêté du 7 octobre 1948 fixant les conditions d'admission et les programmes du concours d'entrée à l'Ecole normale supérieure de l'enseignement technique ;

Vu l'arrêté du 11 janvier 1961 fixant la liste des sections de l'Ecole normale supérieure de l'enseignement technique ;

Vu l'arrêté du 9 janvier 1963 fixant les conditions d'inscription au concours d'admission en première année de l'Ecole normale supérieure de l'enseignement technique ;

Vu l'arrêté du 22 février 1984 prorogé relatif au recrutement à l'Ecole normale supérieure de l'enseignement technique de candidats titulaires de la maîtrise ou d'un diplôme d'ingénieur ;

Vu l'arrêté du 14 novembre 1985 relatif au recrutement à l'Ecole normale supérieure de l'enseignement technique (sections B1, B2, B3, B4) de candidats titulaires d'un brevet de technicien supérieur ou d'un diplôme universitaire de technologie ;

Vu l'avis du Conseil national de l'enseignement supérieur et de la recherche en date du 9 décembre 1985,

Arrête :

Art. 1er. - Les élèves de l'Ecole normale supérieure de Cachan sont recrutés, en 1986, par la voie de concours, ouverts aux candidats des deux sexes, dans des conditions identiques à celles des concours d'entrée à l'Ecole normale supérieure de l'enseignement technique pour les mêmes formations.

Art. 2. - Le directeur des enseignements supérieurs est chargé de l'exécution du présent arrêté, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 21 janvier 1986.

Pour le ministre et par délégation :
Le directeur des enseignements supérieurs,
O. SCHRAMECK

MINISTÈRE DES AFFAIRES SOCIALES ET DE LA SOLIDARITÉ NATIONALE

Décret n° 86-130 du 28 janvier 1986 modifiant le code de la sécurité sociale (deuxième partie : Décrets en Conseil d'Etat) et relatif à la mensualisation de prestations de vieillesse, d'invalidité et d'accidents du travail

Le Premier ministre,

Sur le rapport du ministre de l'économie, des finances et du budget, du ministre de l'agriculture et du ministre des affaires sociales et de la solidarité nationale, porte-parole du Gouvernement,

Vu le code de la sécurité sociale ;

Vu le code rural ;

Vu le décret n° 55-244 du 10 février 1955 portant règlement d'administration publique pour l'application de la loi n° 54-806 du 13 août 1954 ;

Vu l'avis du comité interministériel de coordination en matière de sécurité sociale ;

Vu l'avis du conseil d'administration de la Caisse nationale d'assurance vieillesse des travailleurs salariés ;

Vu l'avis du conseil d'administration de la Caisse nationale de l'assurance maladie des travailleurs salariés ;

Le Conseil d'Etat (section sociale) entendu,

Décrète :

Art. 1er. - Le deuxième alinéa de l'article R. 341-6 du code de la sécurité sociale est remplacé par les dispositions suivantes :

« La majoration pour aide d'une tierce personne est versée jusqu'au dernier jour du mois civil suivant celui au cours duquel l'assuré a été hospitalisé ; au-delà de cette date, son service est suspendu. »

Art. 2. - I. - Le premier alinéa de l'article R. 341-15 du code de la sécurité sociale est remplacé par les dispositions suivantes :

« La pension doit être suspendue, en tout ou partie, par la caisse primaire d'assurance maladie lorsqu'il est constaté que l'intéressé a joui, sous forme de pension d'invalidité et salaire ou gain cumulés, pendant six mois consécutifs, de ressources supérieures au salaire moyen de la dernière année civile précédant l'arrêt de travail suivi d'invalidité. »

II. - Le quatrième alinéa de l'article R. 341-15 du code de la sécurité sociale est remplacé par les dispositions suivantes :

« Le montant des arrérages de chaque mois ultérieur est réduit à concurrence du dépassement constaté au cours du trimestre précédent. »

MINISTÈRE DE L'INDUSTRIE, DES P. ET T. ET DU TOURISME

Décret n° 86-715 du 17 avril 1986 relatif aux attributions du ministre de l'industrie, des P. et T. et du tourisme

Le Président de la République,

Sur le rapport du Premier ministre,

Vu le décret n° 59-178 du 22 janvier 1959 relatif aux attributions des ministres ;

Vu le décret n° 70-878 du 29 septembre 1970, modifié notamment par le décret n° 82-734 du 24 août 1982, relatif au Commissariat à l'énergie atomique, en particulier son article 3 ;

Vu le décret n° 78-977 du 27 septembre 1978 portant organisation de l'administration centrale du ministère de la jeunesse, des sports et des loisirs, en particulier son article 5 ;

Vu le décret n° 79-615 du 13 juillet 1979 modifié relatif à l'organisation et au fonctionnement de l'Agence nationale de valorisation de la recherche (Anvar) ;

Vu le décret n° 84-731 du 26 juillet 1984 relatif aux attributions du ministre du commerce, de l'artisanat et du tourisme ;

Vu le décret n° 84-749 du 2 août 1984 relatif aux attributions du ministre de l'agriculture en matière d'industries du bois, de développement et d'aménagement rural ;

Vu le décret n° 84-750 du 2 août 1984 relatif aux attributions du ministre du redéploiement industriel et du commerce extérieur ;

Vu le décret n° 85-268 du 18 février 1985 portant création de l'établissement public de la Cité des sciences et de l'industrie ;

Vu le décret n° 85-803 du 30 juillet 1985 relatif aux services d'administration centrale propres au ministère du redéploiement industriel et du commerce extérieur ;

Vu le décret n° 85-804 du 30 juillet 1985 relatif aux services d'administration centrale communs au ministère du redéploiement industriel et du commerce extérieur et au ministère de la recherche et de la technologie ;

Vu le décret n° 85-1212 du 20 novembre 1985 relatif aux attributions du ministre des P.T.T. ;

Vu l'arrêté du ministre de l'urbanisme, du logement et des transports en date du 11 décembre 1985 portant organisation de la direction de l'architecture et de l'urbanisme ;

Vu le décret n° 86-129 du 28 janvier 1986 relatif à l'administration centrale du ministère des P.T.T. ;

Vu le décret n° 86-294 du 27 février 1986 instituant un comité interministériel relatif à Eurêka ;

Vu le décret du 20 mars 1986 portant nomination du Premier ministre ;

Vu le décret du 20 mars 1986 portant nomination des membres du Gouvernement ;

Vu le décret n° 86-693 du 4 avril 1986 relatif aux attributions du ministre de la culture et de la communication ;

Vu le décret n° 86-701 du 8 avril 1986 relatif aux attributions du ministre d'Etat, ministre de l'économie, des finances et de la privatisation ;

Vu le décret n° 86-714 du 17 avril 1986 relatif aux attributions du ministre de l'éducation nationale ;

Le Conseil d'Etat (section des travaux publics) entendu ;

Le conseil des ministres entendu,

Décrète :

Art. 1er. - Le ministre de l'industrie, des P. et T. et du tourisme exerce les attributions précédemment dévolues :

1° Par le décret n° 84-750 du 2 août 1984 susvisé, au ministre du redéploiement industriel et du commerce extérieur, à l'exception de celles exercées en matière de commerce extérieur, transférées au ministre d'Etat, ministre de l'économie, des finances et de la privatisation, par le décret du 8 avril 1986 susvisé ;

2° Par le décret n° 85-1212 du 20 novembre 1985 susvisé, au ministre des P.T.T., à l'exception de celles dévolues au ministre de la culture et de la communication par le décret du 4 avril 1986 susvisé ;

3° Par le décret n° 84-731 du 26 juillet 1984 susvisé, au ministre du commerce, de l'artisanat et du tourisme, en matière de tourisme.

Le ministre de l'industrie, des P. et T. et du tourisme donne les impulsions nécessaires au développement par les entreprises d'une politique d'innovation et d'amélioration de leur compétitivité.

Il peut présider, par délégation du Premier ministre, le Comité à l'énergie atomique et le comité interministériel relatif à Eurêka.

Art. 2. - Sont placés sous l'autorité du ministre de l'industrie, des P. et T. et du tourisme :

1° *a)* Les services énumérés par le décret n° 85-803 du 30 juillet 1985 susvisé, à l'exception de la délégation au commerce extérieur ;

b) Les services énumérés par le décret n° 85-804 du 30 juillet 1985 susvisé, sous réserve de ce qui est dit à l'article 4 ci-après au sujet du centre de prospective et d'évaluation ;

c) Le service de l'équipement naval mentionné par le décret n° 84-750 du 2 août 1984 susvisé ;

2° Les services mentionnés par le décret n° 86-129 du 28 janvier 1986 susvisé ;

3° *a)* La direction du tourisme et l'inspection générale du tourisme ;

b) Les services d'étude et d'aménagement touristique chargés de l'espace rural, du littoral et de la montagne ; ces services sont mis, en tant que de besoin, à la disposition du ministre de l'équipement, du logement, de l'aménagement du territoire et des transports et du ministre de l'agriculture.

Art. 3. - Les directions départementales de l'agriculture et de la forêt sont, en tant que de besoin, mises à la disposition du ministre de l'industrie, des P. et T. et du tourisme pour l'exercice de ses attributions en matière de tourisme rural.

Art. 4. - Le ministre de l'industrie, des P. et T. et du tourisme a, conjointement avec le ministre d'Etat, ministre de l'économie, des finances et de la privatisation, autorité sur le service des chambres de commerce et d'industrie. Il a, conjointement avec le ministre de l'éducation nationale, autorité sur le centre de prospective et d'évaluation.

Art. 5. - Le ministre de l'industrie, des P. et T. et du tourisme exerce, conjointement avec le ministre d'Etat, ministre de l'économie, des finances et de la privatisation, la tutelle sur les chambres de commerce et d'industrie. Il exerce, conjointement avec le ministre de l'éducation nationale, la tutelle sur l'Agence nationale de valorisation de la recherche, le Centre national d'études spatiales, l'Agence française de maîtrise de l'énergie et la Cité des sciences et de l'industrie.

Art. 6. - Le premier alinéa de l'article 2 du décret du 27 février 1986 susvisé instituant un comité interministériel relatif à Eurêka est remplacé par la disposition suivante : « ce comité interministériel est présidé par le Premier ministre ou, par délégation, par le ministre chargé de l'industrie ou par le ministre chargé de la recherche ».

Art. 7. - Le Premier ministre, le ministre d'Etat, ministre de l'économie, des finances et de la privatisation, le ministre de la culture et de la communication, le ministre de l'équipement, du logement, de l'aménagement du territoire et des transports, le ministre de l'éducation nationale, le ministre de l'industrie, des P. et T. et du tourisme et le ministre de l'agriculture sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 17 avril 1986.

FRANÇOIS MITTERRAND

Par le Président de la République :

Le Premier ministre,
JACQUES CHIRAC

Le ministre de l'industrie, des P. et T. et du tourisme,
ALAIN MADELIN

Le ministre d'Etat, ministre de l'économie, des finances et de la privatisation,
ÉDOUARD BALLADUR

Le ministre de la culture et de la communication,
FRANÇOIS LÉOTARD

Le ministre de l'équipement, du logement, de l'aménagement du territoire et des transports,
PIERRE MÉHAIGNERIE

Le ministre de l'éducation nationale,
RENÉ MONORY

Le ministre de l'agriculture,
FRANÇOIS GUILLAUME

RECHERCHE ET ENSEIGNEMENT SUPÉRIEUR

Décret n° 86-721 du 24 avril 1986 relatif aux attributions du ministre délégué auprès du ministre de l'éducation nationale, chargé de la recherche et de l'enseignement supérieur

Le Président de la République,

Sur le rapport du Premier ministre et du ministre de l'éducation nationale,

Vu la loi n° 55-425 du 16 avril 1955 portant reorganisation des services des œuvres sociales en faveur des étudiants ;

Vu la loi n° 84-52 du 26 janvier 1984 sur l'enseignement supérieur ;

Vu le décret n° 47-233 du 23 janvier 1947 autorisant les ministres à déléguer, par arrêté, leur signature, modifié par le décret n° 76-830 du 28 août 1976 ;

Vu le décret n° 70-878 du 29 septembre 1970 modifié relatif au Commissariat à l'énergie atomique ;

Vu le décret n° 78-659 du 23 juin 1978 modifiant le décret n° 75-1002 du 29 octobre 1975 relatif à la coordination de la politique de recherche scientifique et technique ;

Vu le décret n° 82-1012 du 30 novembre 1982 relatif au Conseil supérieur de la recherche et de la technologie ;

Vu le décret n° 86-294 du 27 février 1986 instituant un comité interministériel relatif à Eurêka ;

Vu le décret du 20 mars 1986 portant nomination du Premier ministre ;

Vu les décrets des 20 et 25 mars 1986 portant nomination des membres du Gouvernement ;

Vu le décret n° 86-714 du 17 avril 1986 relatif aux attributions du ministre de l'éducation nationale ;

Vu le décret n° 86-720 du 24 avril 1986 relatif aux attributions du secrétaire d'Etat auprès du ministre de l'éducation nationale, chargé de la formation professionnelle,

Décrète :

Art. 1er. - M. Alain Devaquet, ministre délégué auprès du ministre de l'éducation nationale, chargé de la recherche et de l'enseignement supérieur, exerce, par délégation du ministre de l'éducation nationale et sous son autorité, les attributions de ce dernier relatives à la recherche et à l'enseignement supérieur.

Art. 2. - Il peut présider, par délégation du Premier ministre, le comité interministériel de la recherche scientifique et technique, le comité interministériel relatif à Eurêka et le Comité à l'énergie atomique.

Il est chargé de l'enseignement technique et technologique supérieur en liaison avec le secrétaire d'Etat auprès du ministre de l'éducation nationale, chargé de la formation professionnelle.

Il préside, par délégation du ministre de l'éducation nationale, le Conseil national de l'enseignement supérieur et de la recherche et le Conseil supérieur de la recherche et de la technologie et le Comité des programmes.

Pour l'exercice de ses attributions, le ministre délégué auprès du ministre de l'éducation nationale, chargé de la recherche et de l'enseignement supérieur, dispose de la direction générale des enseignements supérieurs et de la recherche, de la direction générale de la recherche et de la technologie, de la mission scientifique et technique, de la délégation à l'information, à la communication et à la culture scientifique et technique et, en tant que de besoin, de l'ensemble des services du ministère de l'éducation nationale.

Il dispose, conjointement avec le ministre de l'industrie, des P. et T. et du tourisme, du centre de prospective et d'évaluation. Il fait appel, en tant que de besoin, au service d'étude des stratégies et statistiques industrielles, à la direction générale du développement régional et de l'environnement industriel et technologique, à la direction de l'administration générale et à la délégation aux affaires internationales du ministère de l'industrie, des P. et T. et du tourisme.

Il exerce, pour le compte du ministre de l'éducation nationale, la tutelle sur le Centre national des œuvres universitaires et scolaires, les centres régionaux des œuvres universitaires et scolaires ainsi que sur les établissements publics et les organismes de recherche relevant du ministre de l'éducation nationale.

Il exerce, pour le compte du ministre de l'éducation nationale, et conjointement avec le ministre de l'industrie, des P. et T. et du tourisme, la tutelle sur l'Agence nationale de valorisation de la recherche, le Centre national d'études spatiales, l'Agence française pour la maîtrise de l'énergie et la Cité des sciences et de l'industrie.

Art. 3. - M. Alain Devaquet reçoit délégation du ministre de l'éducation nationale pour signer en son nom tous actes, arrêtés et décisions dans la limite des attributions mentionnées ci-dessus. Il contresigne, conjointement avec le ministre de l'éducation nationale, les actes relevant de ses attributions.

Il est autorisé à déléguer sa signature dans les conditions prévues par le décret du 23 janvier 1947 susvisé.

Art. 4. - Le Premier ministre, le ministre de l'éducation nationale, le ministre délégué auprès du ministre de l'éducation nationale, chargé de la recherche et de l'enseignement supérieur, le ministre de l'industrie, des P. et T. et du tourisme et le secrétaire d'Etat auprès du ministre de l'éducation nationale, chargé de la formation professionnelle, sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 24 avril 1986.

FRANÇOIS MITTERRAND

Par le Président de la République :

Le Premier ministre,
JACQUES CHIRAC

Le ministre délégué auprès du ministre de l'éducation nationale, chargé de la recherche et de l'enseignement supérieur,
ALAIN DEVAQUET

Le ministre de l'éducation nationale,
RENÉ MONORY

Le ministre de l'industrie, des P. et T. et du tourisme,
ALAIN MADELIN

Le secrétaire d'Etat auprès du ministre de l'éducation nationale, chargé de la formation professionnelle,
NICOLE CATALA

MINISTÈRE DE L'ÉDUCATION NATIONALE, DE LA RECHERCHE ET DES SPORTS

Décret n° 88-726 du 28 mai 1988 relatif aux attributions du ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports

NOR : *MENX8800068D*

Le Président de la République,

Sur le rapport du Premier ministre,

Vu le décret n° 59-178 du 22 janvier 1959 relatif aux attributions des ministres ;

Vu le décret n° 79-615 du 13 juillet 1979 modifié relatif à l'organisation et au fonctionnement de l'Agence nationale de valorisation de la recherche (Anvar) ;

Vu le décret n° 82-768 du 9 septembre 1982 relatif à l'organisation de l'administration centrale du ministère de la recherche et de l'industrie, en particulier son article 2 ;

Vu le décret n° 84-510 du 28 juin 1984 relatif au Centre national des études spatiales ;

Vu le décret n° 85-268 du 18 février 1985 portant création de l'Etablissement public de la cité des sciences et de l'industrie ;

Vu le décret n° 86-691 du 3 avril 1986 relatif aux attributions du secrétaire d'Etat auprès du Premier ministre chargé de la jeunesse et des sports ;

Vu le décret n° 86-714 du 17 avril 1986 relatif aux attributions du ministre de l'éducation nationale ;

Vu le décret n° 86-1250 du 8 décembre 1986 relatif à l'organisation de l'administration centrale du ministère de l'industrie, des P. et T. et du tourisme, en particulier ses articles 1er, 4 et 18 ;

Vu le décret du 10 mai 1988 portant nomination du Premier ministre ;

Vu le décret du 12 mai 1988 portant nomination des membres du Gouvernement ;

Le Conseil d'Etat (section de l'intérieur) entendu ;

Le conseil des ministres entendu,

Décrète :

Art. 1er. - Le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, exerce les attributions dévolues au ministre de l'éducation nationale par l'article 1er du décret du 17 avril 1986 susvisé.

Il exerce, en matière de recherche, les attributions définies par l'article 2 (1er et 3e alinéas) du décret du 17 avril 1986 susvisé.

Il contribue à la définition et à la mise en œuvre de la politique du Gouvernement en matière d'innovation, de valorisation de la recherche et de transferts de technologies.

Il exerce les attributions dévolues au Premier ministre en matière de jeunesse et de sports par le décret du 3 avril 1986 susvisé.

Art. 2. - Au titre de ses attributions relatives à la recherche, le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, prépare avec le ministre d'Etat, ministre de l'économie, des finances et du budget, les décisions du Gouvernement relatives à l'attribution des ressources et des moyens alloués par l'Etat dans le cadre du budget civil de recherche et de développement technologique ; à cet effet, les ministres présentent au ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, leurs propositions de crédits de recherche. Toutefois, en ce qui concerne les crédits relatifs à l'espace, il exerce cette compétence conjointement avec le ministre chargé de l'espace.

Au même titre, le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, exerce, conjointement avec le ministre de l'industrie, du commerce extérieur et de l'aménagement du territoire, la tutelle de l'Agence nationale pour la valorisation de la recherche et de la cité des sciences et de l'industrie et, conjointement avec le ministre des postes et télécommunications et de l'espace, la tutelle du Centre national des études spatiales.

Au même titre, il a autorité sur le centre de prospective et d'évaluation, institué par l'article 2 du décret n° 82-768 du 9 septembre 1982 susvisé, et dispose, en tant que de besoin, de la direction générale de l'industrie et de la direction de l'administration générale du ministère de l'industrie, ainsi que des directions régionales de l'industrie et de la recherche.

Art. 3. - Pour l'exercice de ses attributions en matière de jeunesse et de sports, le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, exerce son autorité ou sa tutelle sur les services ou établissements qui relevaient du secrétaire d'Etat auprès du Premier ministre, chargé de la jeunesse et des sports en vertu de l'article 2 du décret du 3 avril 1986 susvisé.

Art. 4. - Le Premier ministre, le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, le ministre d'Etat, ministre de l'économie, des finances et du budget, le ministre de l'industrie, du commerce extérieur et de l'aménagement du territoire et le ministre des postes et télécommunications et de l'espace, sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 28 mai 1988.

FRANÇOIS MITTERRAND

Par le Président de la République :

Le Premier ministre,
MICHEL ROCARD

Le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports,
LIONEL JOSPIN

Le ministre d'Etat, ministre de l'économie, des finances et du budget,
PIERRE BÉRÉGOVOY

Le ministre de l'industrie, du commerce extérieur et de l'aménagement du territoire,
ROGER FAUROUX

Le ministre des postes et télécommunications et de l'espace,
PAUL QUILÈS

MINISTÈRE DES POSTES ET TÉLÉCOMMUNICATIONS ET DE L'ESPACE

Décret n° 88-741 du 3 juin 1988 relatif aux attributions du ministre des postes et télécommunications et de l'espace

NOR : *PTTX8800064D*

Le Président de la République,

Sur le rapport du Premier ministre,

Vu la loi n° 86-1067 du 30 septembre 1986 modifiée relative à la liberté de communication ;

Vu le décret n° 59-178 du 22 janvier 1959 relatif aux attributions des ministres ;

Vu le décret n° 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales ;

Vu le décret n° 85-1212 du 20 novembre 1985 relatif aux attributions du ministre des P.T.T. ;

Vu le décret n° 86-129 du 28 janvier 1986 modifié portant organisation de l'administration centrale du ministère des P.T.T. ;

Vu le décret n° 86-1250 du 8 décembre 1986 relatif à l'organisation de l'administration centrale du ministère de l'industrie, des P. et T. et du tourisme ;

Vu le décret du 10 mai 1988 portant nomination du Premier ministre ;

Vu le décret du 12 mai 1988 portant nomination des membres du Gouvernement ;

Le Conseil d'Etat (section des travaux publics) entendu ;

Le conseil des ministres entendu,

Décrète :

Art. 1er. - Le ministre des postes et télécommunications et de l'espace exerce les attributions précédemment dévolues par le décret du 20 novembre 1985 susvisé au ministre des P.T.T., à l'exception de celles qui ont été transférées par l'effet de la loi du 30 septembre 1986 susvisée.

Il assure la cohérence de l'action gouvernementale en matière de politique spatiale.

Art. 2. - Le ministre des postes et télécommunications et de l'espace a autorité sur les services énumérés par le décret du 28 janvier 1986 susvisé.

Il dispose pour l'exercice de ses attributions de la direction générale de l'industrie.

Art. 3. - Le ministre des postes et télécommunications et de l'espace exerce, conjointement avec le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, la tutelle sur le Centre national d'études spatiales.

A ce titre, il exerce les attributions dévolues au ministre chargé de l'industrie par le décret du 28 juin 1984 susvisé.

Art. 4. - Le Premier ministre, le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, le ministre de la défense, le ministre de l'industrie, du commerce extérieur et de l'aménagement du territoire, le ministre de la culture et de la communication, le ministre des postes et télécommunications et de l'espace et le ministre délégué auprès du ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, chargé de la recherche, sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 3 juin 1988.

FRANÇOIS MITTERRAND

Par le Président de la République :

Le Premier ministre,
MICHEL ROCARD

Le ministre des postes et télécommunications et de l'espace,
PAUL QUILÈS

Le ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports,
LIONEL JOSPIN

Le ministre de la défense,
JEAN-PIERRE CHEVÈNEMENT

Le ministre de l'industrie, du commerce extérieur et de l'aménagement du territoire,
ROGER FAUROUX

Le ministre de la culture et de la communication,
JACK LANG

Le ministre délégué auprès du ministre d'Etat, ministre de l'éducation nationale, de la recherche et des sports, chargé de la recherche,
HUBERT CURIEN

MINISTÈRE DES POSTES, DES TÉLÉCOMMUNICATIONS ET DE L'ESPACE

Décret n° 88-837 du 20 juillet 1988 relatif aux attributions du ministre des postes, des télécommunications et de l'espace

NOR PTTX8800096D

Le Président de la République,

Sur le rapport du Premier ministre,

Vu le décret n° 59-178 du 22 janvier 1959 relatif aux attributions des ministres ;

Vu le décret n° 88-741 du 3 juin 1988 relatif aux attributions du ministre des postes et télécommunications et de l'espace ;

Vu le décret n° 88-838 du 20 juillet 1988 relatif aux attributions du ministre de la recherche et de la technologie ;

Vu le décret du 23 juin 1988 portant nomination du Premier ministre ;

Vu le décret du 28 juin 1988 portant nomination des membres du Gouvernement ;

Le Conseil d'Etat (section des travaux publics) entendu ;

Le conseil des ministres entendu,

Décrète :

Art. 1er. - Le ministre des postes, des télécommunications et de l'espace exerce, dans les mêmes conditions, les attributions précédemment dévolues au ministre des postes et télécommunications et de l'espace par le décret du 3 juin 1988 susvisé.

Art. 2. - Le Premier ministre, le ministre de la défense, le ministre de l'industrie et de l'aménagement du territoire, le ministre de la culture, de la communication, des grands travaux et du Bicentenaire, le ministre des postes, des télécommunications et de l'espace et le ministre de la recherche et de la technologie sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 20 juillet 1988.

FRANÇOIS MITTERRAND

Par le Président de la République :

Le Premier ministre,
MICHEL ROCARD

Le ministre des postes,
des télécommunications et de l'espace,
PAUL QUILÈS

Le ministre de la défense,
JEAN-PIERRE CHEVÈNEMENT

Le ministre de l'industrie et de l'aménagement du territoire,
ROGER FAUROUX

Le ministre de la culture, de la communication,
des grands travaux et du Bicentenaire,
JACK LANG

Le ministre de la recherche et de la technologie,
HUBERT CURIEN

MINISTÈRE DE LA RECHERCHE ET DE LA TECHNOLOGIE

Décret n° 88-838 du 20 juillet 1988 relatif aux attributions du ministre de la recherche et de la technologie

NOR : *RESX8801105D*

Le Président de la République,

Sur le rapport du Premier ministre,

Vu le décret n° 59-178 du 22 janvier 1959 relatif aux attributions des ministres ;

Vu le décret n° 70-879 du 29 septembre 1970 modifié relatif au Commissariat à l'énergie atomique ;

Vu le titre Ier du décret n° 75-1002 du 29 octobre 1975 relatif à la coordination de la recherche scientifique et technique, modifié par le décret n° 78-659 du 23 juin 1978 ;

Vu le décret n° 79-615 du 13 juillet 1979 modifié relatif à l'organisation et au fonctionnement de l'Agence nationale de valorisation de la recherche (Anvar) ;

Vu le décret n° 82-768 du 9 septembre 1982 relatif à l'organisation de l'administration centrale du ministère de la recherche et de l'industrie, en particulier son article 2 ;

Vu le décret n° 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales ;

Vu le décret n° 85-268 du 18 février 1985 portant création de l'établissement public de la Cité des sciences et de l'industrie ;

Vu le décret n° 86-294 du 27 février 1986 instituant un comité interministériel relatif à Eurêka, modifié par le décret n° 86-715 du 17 avril 1986 ;

Vu le décret n° 86-1264 du 6 décembre 1986 relatif à l'organisation des services d'administration centrale chargés de la recherche mis à disposition du ministre délégué auprès du ministre de l'éducation nationale, chargé de la recherche et de l'enseignement supérieur ;

Vu le décret n° 86-1250 du 8 décembre 1986 relatif à l'organisation de l'administration centrale du ministère de l'industrie, des P. et T. et du tourisme, en particulier ses articles 1er, 4 et 18 ;

Vu le décret du 23 juin 1988 portant nomination du Premier ministre ;

Vu le décret du 28 juin 1988 portant nomination des membres du Gouvernement ;

Le Conseil d'Etat (section des travaux publics) entendu ;

Le conseil des ministres entendu,

Décrète :

Art. 1er. - Le ministre de la recherche et de la technologie a compétence pour proposer et, en liaison avec les autres ministres intéressés, mettre en œuvre la politique du Gouvernement dans le domaine de la recherche et de la technologie.

Il prépare avec le ministre d'Etat, ministre de l'économie, des finances et du budget, les décisions du Gouvernement relatives à l'attribution des ressources et des moyens alloués par l'Etat dans le cadre du budget civil de recherche et de développement technologique ; à cet effet, les ministres présentent au ministre de la recherche et de la technologie leurs propositions de crédits de recherche. Toutefois, en ce qui concerne les crédits relatifs à l'espace, il exerce cette compétence conjointement avec le ministre chargé de l'espace.

En ce qui concerne les établissements publics et autres organismes publics de recherche, le ministre de la recherche et de la technologie prépare et met en œuvre, en liaison avec les ministres intéressés, les réformes concernant l'organisation, les statuts du personnel et toutes les mesures ayant une incidence sur la politique de l'emploi scientifique. Il contresigne les textes pris dans ces domaines.

Il est chargé de l'évaluation des travaux de recherche conduits par les établissements publics et les organismes de recherche dont les crédits sont inscrits au budget civil de recherche et de développement technologique.

Il est consulté sur les programmes de recherche des entreprises nationales.

Art. 2. - Le ministre de la recherche et de la technologie préside, par délégation du Premier ministre, le comité interministériel relatif à Eurêka. Il peut présider, par délégation du Premier ministre, le comité interministériel de la recherche scientifique et technique et le comité à l'énergie atomique.

Art. 3. - Le ministre de la recherche et de la technologie a autorité sur les services énumérés par le décret du 6 décembre 1986 susvisé ainsi que sur le centre de prospective et d'évaluation institué par l'article 2 du décret du 9 septembre 1982 susvisé ; il dispose, en tant que de besoin, de la direction générale de l'industrie et de la direction de l'administration générale du ministère de l'industrie ainsi que des directions régionales de l'industrie et de la recherche.

Art. 4. - Le ministre de la recherche et de la technologie exerce, conjointement avec le ministre de l'industrie et de l'aménagement du territoire, la tutelle de l'Agence nationale pour la valorisation de la recherche et de la Cité des sciences et de l'industrie et, conjointement avec le ministre des postes, des télécommunications et de l'espace, la tutelle du Centre national d'études spatiales.

Art. 5. - Le ministre de la recherche et de la technologie est associé aux actions de coopération scientifique internationale. Il suit et coordonne, en liaison avec le ministre d'Etat, ministre des affaires étrangères, et le ministre de la coopération et du développement, les actions poursuivies dans ce domaine par les organismes de recherche.

Art. 6. - Le Premier ministre, le ministre d'Etat, ministre de l'économie, des finances et du budget, le ministre d'Etat, ministre des affaires étrangères, le ministre de l'industrie et de l'aménagement du territoire, le ministre de la coopération et du développement, le ministre des postes, des télécommunications et de l'espace et le ministre de la recherche et de la technologie sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 20 juillet 1988.

FRANÇOIS MITTERRAND

Par le Président de la République :

Le Premier ministre,
MICHEL ROCARD

Le ministre de la recherche et de la technologie,
HUBERT CURIEN

Le ministre d'Etat, ministre de l'économie, des finances et du budget,
PIERRE BÉRÉGOVOY

Le ministre d'Etat, ministre des affaires étrangères,
ROLAND DUMAS

Le ministre de l'industrie et de l'aménagement du territoire,
ROGER FAUROUX

Le ministre de la coopération et du développement,
JACQUES PELLETIER

Le ministre des postes, des télécommunications et de l'espace,
PAUL QUILÈS

MINISTÈRE DES POSTES, DES TÉLÉCOMMUNICATIONS ET DE L'ESPACE

Décret n° 88-1121 du 14 décembre 1988 modifiant le décret n° 86-129 du 28 janvier 1986 modifié portant organisation de l'administration centrale du ministère des P.T.T.

NOR : *PTTC8801060D*

Le Premier ministre,

Sur le rapport du ministre des postes, des télécommunications et de l'espace,

Vu le décret n° 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales, modifié par le décret n° 88-837 du 20 juillet 1988 relatif aux attributions du ministre des postes, des télécommunications et de l'espace ;

Vu le décret n° 86-129 du 28 janvier 1986 modifié portant organisation de l'administration centrale du ministère des P.T.T. ;

Vu le décret n° 87-389 du 15 juin 1987 relatif à l'organisation des services d'administration centrale ;

Vu le décret n° 88-837 du 20 juillet 1988 relatif aux attributions du ministre des postes, des télécommunications et de l'espace ;

Vu l'avis en date du 3 octobre 1988 du Conseil supérieur des postes et télécommunications ;

Vu l'avis en date du 13 octobre 1988 du comité technique paritaire ministériel du ministère des postes, des télécommunications et de l'espace ;

Le Conseil d'Etat (section des travaux publics) entendu,

Décrète :

Art. 1er. - Le 5 du premier alinéa de l'article 1er du décret du 28 janvier 1986 modifié susvisé est modifié comme suit :

« 5. La délégation générale à l'espace.

« 6. Le comité des enseignements supérieurs. »

Art. 2. - Le décret du 28 janvier 1986 modifié susvisé est complété par un article 19 *bis* ainsi rédigé :

« *Art. 19* bis. - La délégation générale à l'espace relève directement de l'autorité du ministre.

« Elle mène les études et prépare les actions nécessaires pour assurer la cohérence de l'action gouvernementale en matière de politique spatiale. Elle prépare les réunions convoquées à cet effet. Elle assure le secrétariat et le suivi des décisions de ces réunions.

« Elle coordonne la représentation du ministère dans les instances nationales et internationales ayant compétence en matière d'espace.

« Elle assiste le ministre pour l'exercice de la tutelle sur le Centre national d'études spatiales. »

Art. 3. - Le ministre d'Etat, ministre de l'économie, des finances et du budget, le ministre de la fonction publique et les réformes administratives, le ministre des postes, des télécommunications et de l'espace et le ministre délégué auprès du ministre d'Etat, ministre de l'économie, des finances et du budget, chargé du budget, sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 14 décembre 1988.

MICHEL ROCARD

Par le Premier ministre :

Le ministre des postes, des télécommunications et de l'espace,
PAUL QUILÈS

Le ministre d'Etat, ministre de l'économie, des finances et du budget,
PIERRE BÉRÉGOVOY

Le ministre de la fonction publique et des réformes administratives,
MICHEL DURAFOUR

Le ministre délégué auprès du ministre d'Etat, ministre de l'économie, des finances et du budget, chargé du budget,
MICHEL CHARASSE

MINISTÈRE DES POSTES, DES TÉLÉCOMMUNICATIONS ET DE L'ESPACE

Décret du 6 janvier 1989 portant nomination d'un délégué général à l'administration centrale

NOR : *PTTC8801123D*

Le Président de la République,

Sur le rapport du Premier ministre et du ministre des postes, des télécommunications et de l'espace,

Vu l'article 13 de la Constitution ;

Vu la loi n° 83-634 du 13 juillet 1983 relative aux droits et obligations des fonctionnaires ;

Vu la loi n° 84-16 du 11 janvier 1984 modifiée portant dispositions statutaires relatives à la fonction publique de l'Etat, notamment son article 25 ;

Vu le décret n° 85-779 du 24 juillet 1985 modifié portant application de l'article 25 de la loi n° 84-16 du 11 janvier 1984 fixant les emplois supérieurs pour lesquels les nominations sont laissées à la décision du Gouvernement ;

Vu le décret n° 86-129 du 28 janvier 1986 modifié portant organisation de l'administration centrale du ministère des P.T.T., notamment le décret n° 88-1121 du 14 décembre 1988 ;

Vu le décret n° 88-837 du 20 juillet 1988 relatif aux attributions du ministre des postes, des télécommunications et de l'espace ;

Le conseil des ministres entendu,

Décrète :

Art. 1er. - M. Michel Petit, ingénieur général des télécommunications, est nommé délégué général à l'espace.

Art. 2. - Le Premier ministre et le ministre des postes, des télécommunications et de l'espace sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 6 janvier 1989.

FRANÇOIS MITTERRAND

Par le Président de la République :

Le Premier ministre,
MICHEL ROCARD

Le ministre des postes, des télécommunications et de l'espace,
PAUL QUILÈS

MINISTÈRE DES POSTES, DES TÉLÉCOMMUNICATIONS ET DE L'ESPACE

Décret n° 89-77 du 6 février 1989 modifiant le décret n° 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales

NOR : *PTTC8901121D*

Le Premier ministre,

Sur le rapport du ministre des postes, des télécommunications et de l'espace et du ministre de la recherche et de la technologie,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un Centre national d'études spatiales, et notamment son article 5 ;

Vu la loi n° 82-610 du 15 juillet 1982 d'orientation et de programmation pour la recherche et le développement technologique de la France ;

Vu la loi n° 83-675 du 26 juillet 1983 modifiée relative à la démocratisation du secteur public, ensemble le décret n° 83-1160 du 26 décembre 1983 portant application de cette loi ;

Vu le décret n° 53-707 du 9 août 1953 modifié relatif au contrôle de l'Etat sur les entreprises publiques nationales et certains organismes ayant un objet d'ordre économique ou social ;

Vu le décret n° 55-733 du 26 mai 1955 modifié relatif au contrôle économique et financier de l'Etat ;

Vu le décret n° 59-587 du 29 avril 1959 relatif aux nominations aux emplois de direction de certains établissements publics, entreprises publiques et sociétés nationales, modifié par le décret n° 67-152 du 22 février 1967 ;

Vu le décret n° 62-1587 du 29 décembre 1962 portant règlement général sur la comptabilité publique ;

Vu le décret n° 84-510 du 28 juin 1984 relatif au Centre national d'études spatiales ;

Vu le décret n° 88-837 du 20 juillet 1988 relatif aux attributions du ministre des postes, des télécommunications et de l'espace ;

Le Conseil d'Etat (section des travaux publics) entendu,

Décrète :

Art. 1er. – Dans le décret du 28 juin 1984 susvisé les mots : « des ministres chargés de l'industrie et de la recherche » sont remplacés par les mots : « des ministres chargés de l'espace et de la recherche » ; les mots : « des ministres chargés de l'industrie ou de la recherche » sont remplacés par les mots : « des ministres chargés de l'espace ou de la recherche ».

Art. 2. – I. – Dans le 1° de l'article 1er du décret du 28 juin 1984 susvisé la mention : « un représentant du ministre chargé des P.T.T. » est remplacée par la mention : « un représentant du ministre chargé de l'industrie ».

II. – Dans l'article 11 du même décret les mots : « crédits budgétaires ouverts notamment aux budgets des ministères de l'industrie et de la recherche qui lui sont affectés » sont remplacés par les mots : « crédits budgétaires de l'Etat qui lui sont affectés ».

Art. 3. – Le ministre d'Etat, ministre de l'économie, des finances et du budget, le ministre d'Etat, ministre des affaires étrangères, le ministre de la défense, le ministre de l'industrie et de l'aménagement du territoire, le ministre des postes, des télécommunications et de l'espace, le ministre de la recherche et de la technologie et le ministre délégué auprès du ministre d'Etat, ministre de l'économie, des finances et du budget, chargé du budget, sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 6 février 1989.

MICHEL ROCARD

Par le Premier ministre :

Le ministre des postes, des télécommunications et de l'espace,
PAUL QUILÈS

Le ministre d'Etat, ministre de l'économie, des finances et du budget,
PIERRE BÉRÉGOVOY

Le ministre d'Etat, ministre des affaires étrangères,
ROLAND DUMAS

Le ministre de la défense,
JEAN-PIERRE CHEVÈNEMENT

Le ministre de l'industrie et de l'aménagement du territoire,
ROGER FAUROUX

Le ministre de la recherche et de la technologie,
HUBERT CURIEN

Le ministre délégué auprès du ministre d'Etat, ministre de l'économie, des finances et du budget, chargé du budget,
MICHEL CHARASSE

MINISTÈRE DES POSTES, DES TÉLÉCOMMUNICATIONS ET DE L'ESPACE

Décret n° 89-508 du 19 juillet 1989 portant création du comité de l'espace

NOR : *PTTC8900484D*

Le Premier ministre,

Sur le rapport du ministre des postes, des télécommunications et de l'espace,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un Centre national d'études spatiales ;

Vu le décret n° 84-510 du 28 juin 1984 modifié relatif au centre national d'études spatiales ;

Vu le décret n° 86-129 du 28 janvier 1986 portant organisation de l'administration centrale du ministère des P.T.T., modifié notamment par le décret n° 88-1121 du 14 décembre 1988 ;

Vu le décret n° 88-837 du 20 juillet 1988 relatif aux attributions du ministre des postes, des télécommunications et de l'espace,

Décrète :

Art. 1er. – Il est créé auprès du ministre chargé de l'espace, et sous sa présidence, un comité de l'espace qui comprend :

- le secrétaire général du ministère des affaires étrangères ;
- le délégué général pour l'armement ;
- le directeur général de l'industrie ;
- le directeur général des télécommunications ;
- le directeur général de la recherche et de la technologie ;
- le directeur du budget ;
- le chef d'état-major des armées ;
- le délégué général à l'espace ;
- le président et le directeur général du Centre national d'études spatiales.

Art. 2. – Pour concourir à l'objectif de cohérence de la politique spatiale, le Comité de l'espace a pour missions :

a) De préparer les décisions du Gouvernement relatives à la politique spatiale ;

b) D'examiner l'influence des programmes spatiaux sur l'industrie française et européenne ;

c) De préparer, notamment sur rapport du directeur général du Centre national d'études spatiales, les orientations relatives à la position de la France en matière de collaboration spatiale internationale ;

d) Enfin, de proposer au Premier ministre toute action qui lui semble nécessaire.

Art. 3. – Le Comité de l'espace se réunit au moins deux fois par an sur convocation de son président. En fonction de l'ordre du jour établi par le président, le comité peut s'adjoindre à titre consultatif des représentants des départements ministériels intéressés et faire appel à des experts qualifiés.

Le secrétariat du comité est assuré par la délégation générale à l'espace en liaison avec le Centre national d'études spatiales.

Art. 4. – Le ministre d'Etat, ministre de l'économie, des finances et du budget, le ministre d'Etat, ministre des affaires étrangères, le ministre de la défense, le ministre de l'industrie et de l'aménagement du territoire, le ministre des postes, des télécommunications et de l'espace, le ministre de la recherche et de la technologie et le ministre délégué auprès du ministre d'Etat, ministre de l'économie, des finances et du budget, chargé du budget, sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 19 juillet 1989.

MICHEL ROCARD

Par le Premier ministre :

Le ministre des postes, des télécommunications et de l'espace,
PAUL QUILÈS

Le ministre d'Etat, ministre de l'économie, des finances et du budget,
PIERRE BÉRÉGOVOY

Le ministre d'Etat, ministre des affaires étrangères,
ROLAND DUMAS

Le ministre de la défense,
JEAN-PIERRE CHEVÈNEMENT

Le ministre de l'industrie et de l'aménagement du territoire,
ROGER FAUROUX

Le ministre de la recherche et de la technologie,
HUBERT CURIEN

Le ministre délégué auprès du ministre d'Etat, ministre de l'économie, des finances et du budget, chargé du budget,
MICHEL CHARASSE

MINISTÈRE DES POSTES, DES TÉLÉCOMMUNICATIONS ET DE L'ESPACE

Décret n° 90-1121 du 19 décembre 1990 portant organisation de l'administration centrale du ministère des postes, des télécommunications et de l'espace

NOR : *PTTC9000965D*

Le Premier ministre,

Sur le rapport du ministre d'Etat, ministre de la fonction publique et des réformes administratives, et du ministre des postes, des télécommunications et de l'espace,

Vu le code des postes et télécommunications ;

Vu la loi n° 90-568 du 2 juillet 1990 relative à l'organisation du service public de la poste et des télécommunications ;

Vu le décret n° 87-389 du 15 juin 1987 relatif à l'organisation des services d'administration centrale ;

Vu le décret n° 88-837 du 20 juillet 1988 relatif aux attributions du ministre des postes, des télécommunications et de l'espace ;

Vu l'avis du comité technique paritaire ministériel du ministère des postes, des télécommunications et de l'espace en date du 15 novembre 1990 ;

Vu l'avis du Conseil supérieur des postes et télécommunications en date du 19 novembre 1990 ;

Le Conseil d'Etat (section des travaux publics) entendu,

Décrète :

Art. 1er. - Sous l'autorité directe du ministre, l'administration centrale du ministère des postes, des télécommunications et de l'espace comprend :

1. L'inspection générale ;
2. La direction de la réglementation générale ;
3. La direction du service public ;
4. La délégation générale à l'espace ;
5. La direction de l'administration générale.

Elle comprend en outre le bureau du cabinet, le service de l'information et de la communication et le service de défense et de sécurité civile, directement rattachés au cabinet du ministre.

Art. 2. - L'inspection générale effectue, pour le compte du ministre et dans tous les domaines ressortissant aux attributions de celui-ci, les missions d'information, d'enquête, de conseil, de représentation, de contrôle et d'évaluation, qui lui sont confiées.

Elle exerce, au nom du ministre et par délégation, le contrôle supérieur sur tous les personnels et services qui relèvent directement du ministre, ainsi que sur les établissements publics administratifs placés sous sa tutelle.

Dans le cadre des pouvoirs de tutelle du ministre, elle effectue des contrôles portant sur la régularité du fonctionnement, ainsi que sur les comptes et la gestion des organismes du secteur des postes, des télécommunications et de l'espace qui sont ou peuvent être soumis au contrôle de la Cour des comptes en vertu de l'article 6 *bis* (A et B) de la loi n° 67-483 du 22 juin 1967 modifiée.

Elle procède à l'évaluation des politiques publiques du ministère. En vertu d'ordres de mission du ministre, elle évalue les actions et les résultats des organismes mentionnés à l'alinéa précédent qui mettent en œuvre ces politiques.

Pour l'exercice de ces missions, les membres de l'inspection générale ont tous pouvoirs d'investigation sur pièces et sur place ; ils peuvent être assistés par des fonctionnaires et par des experts désignés par le ministre.

L'inspection générale des postes et télécommunications est composée d'inspecteurs généraux des postes et télécommunications et d'ingénieurs généraux des télécommunications qui y sont affectés par arrêté du ministre chargé des postes et télécommunications. Le ministre désigne parmi eux, dans les mêmes formes, le chef de l'inspection générale.

Art. 3. - La direction de la réglementation générale définit et adapte le cadre juridique général dans lequel s'exercent les activités relevant des secteurs des postes et télécommunications.

Elle veille au respect de la réglementation en vigueur.

Elle analyse et étudie de façon prospective l'évolution, aux plans national et international, de l'environnement social, économique, technique et juridique des activités des secteurs des postes et télécommunications.

Elle prépare les projets de loi et de règlement et élabore toutes directives ministérielles relatives au régime des activités des différents acteurs économiques intervenant dans les secteurs des postes et télécommunications.

Elle coordonne la représentation du ministère dans les discussions et négociations internationales concernant les postes et les télécommunications, sous réserve des attributions de la direction du service public. En particulier, elle assure la représentation du ministère en matière de réglementation générale et participe, en tant que de besoin, aux réunions des comités, commissions ou groupes chargés de l'étude des problèmes de technique d'exploitation ou de normalisation.

Elle instruit les demandes d'autorisation et les déclarations préalables adressées au ministre en application du code des postes et télécommunications. Elle établit les cahiers des charges et veille à ce que les obligations contractées par les titulaires d'autorisations soient respectées.

En liaison avec le comité de coordination des télécommunications, elle prépare la répartition des bandes de fréquence et des fréquences radioélectriques qui sont attribuées au ministre chargé des postes et télécommunications, pour le compte de l'exploitant public et des utilisateurs autorisés par le ministre.

Elle met en forme et publie les spécifications et procédures d'agrément régissant les équipements terminaux destinés à être connectés à un réseau ouvert au public et les installations radioélectriques ; elle délivre les agréments des équipements terminaux.

Elle assure le secrétariat du Conseil national des postes et télécommunications.

Le directeur de la réglementation générale a autorité sur le chef du service national des radiocommunications.

Art. 4. - La direction du service public exerce au nom du ministre la tutelle des exploitants publics, La Poste et France Télécom, de leurs services gérés en commun, ainsi que des établissements publics administratifs qui sont rattachés au ministère.

Elle prépare les projets de textes spécifiques aux exploitants publics et à leurs services communs et veille à leur application.

Elle représente le ministre au sein des instances interministérielles ayant à connaître des activités et des questions de personnel de La Poste et de France Télécom ; elle coordonne la représentation de l'Etat dans les conseils d'administration des deux exploitants publics.

Elle apporte son concours au secrétariat de la commission supérieure du service public des postes et télécommunications ; elle assure le secrétariat de la Commission supérieure du personnel et des affaires sociales.

Art. 5. - La délégation générale à l'espace mène des études et prépare les actions nécessaires pour assurer la cohérence de l'action gouvernementale en matière de politique spatiale. Elle prépare les réunions tenues à cet effet. Elle assure le secrétariat et le suivi des décisions de ces réunions.

Elle prépare et mène les actions du ministère dans les instances nationales, internationales et communautaires ayant compétence en matière d'espace. Elle prépare et mène l'action du ministère en matière de coopération, de recherche et en ce qui concerne la diffusion à l'étranger des matériels et des techniques, dans le domaine de l'espace.

Elle assiste le ministre pour l'exercice de la tutelle sur le Centre national d'études spatiales, notamment en matière budgétaire ; elle examine les documents et décisions soumis par le Centre national d'études spatiales à l'approbation du ministre.

Elle prépare les projets de texte concernant en propre les organismes ou instances compétentes en matière spatiale et veille à leur application.

Art. 6. – La direction de l'administration générale a pour mission de fournir à l'ensemble des services du ministère les moyens de leur activité. Elle est compétente dans les domaines du budget, de la comptabilité et du personnel du ministère.

Elle assure la préparation des documents budgétaires soumis au Parlement et des décisions nécessaires à l'exécution du budget.

Elle prépare les cahiers des charges des exploitants publics et veille à l'application de leurs dispositions, sous réserve des attributions de la direction de la réglementation générale.

Elle prépare pour le compte de l'Etat les contrats de plan des exploitants publics, participe à leur négociation et en assure le suivi.

Elle examine les documents et décisions soumis par les exploitants publics à l'approbation du ministre.

Elle assure le suivi de la politique tarifaire des exploitants et met en œuvre notamment les procédures relatives aux tarifs prévues par leurs cahiers des charges.

Elle élabore les orientations générales dans lesquelles s'inscrivent les activités des exploitants publics et notamment leur offre de services ; dans ce but elle étudie, en liaison avec les exploitants publics, de manière prospective, les services que ceux-ci sont susceptibles d'offrir ; elle prend toute disposition utile de nature à maintenir la complémentarité des activités de La Poste et de France Télécom.

Elle assure, pour ce qui la concerne, en liaison avec la direction de la réglementation générale, la représentation internationale du ministère ; elle prépare l'action du ministère en matière de coopération et de recherche et en ce qui concerne la diffusion à l'étranger des matériels et des techniques, dans les domaines des postes et des télécommunications.

Elle assume les compétences du ministère dans les domaines du personnel et des affaires sociales des exploitants publics ; en concertation avec ceux-ci, elle prépare les statuts particuliers des personnels fonctionnaires de La Poste et de France Télécom ; elle veille à l'application des dispositions de la loi du 2 juillet 1990 relatives au personnel et aux affaires sociales des exploitants publics, notamment les principes et garanties énumérés à l'article 34 de la loi ; elle reçoit et exploite les informations et documents prévus à cet effet par les cahiers des charges.

Elle coordonne la gestion du corps des ingénieurs des télécommunications et des corps des administrateurs et des inspecteurs généraux des postes et télécommunications.

Elle examine les conventions constitutives des groupements d'intérêt public et des groupements d'intérêt économique, constitués entre La Poste et France Télécom, proposées à l'approbation du ministre.

Elle prépare les décisions que les cahiers des charges des exploitants publics réservent à la compétence du ministre en matière d'enseignement supérieur.

Elle participe à la définition des orientations et des objectifs des groupements d'intérêt public constitués dans le domaine social ; elle assure le suivi de l'effort social de chaque exploitant public.

Elle est chargée de la réglementation, de la description et du contrôle des opérations budgétaires et comptables ainsi que de l'information des autorités de gestion et de ce contrôle.

Elle assure le recrutement, l'avancement, la formation, les affectations, la gestion des carrières, la discipline et le service des pensions des agents du ministère.

Elle est chargée d'assurer les moyens logistiques nécessaires au fonctionnement du ministère, notamment par l'acquisition et la gestion des biens mobiliers et immobiliers.

Elle assure la concertation et la négociation avec les organisations syndicales représentatives des personnels du ministère dans le cadre des pouvoirs propres du ministre en la matière.

Elle est responsable pour l'ensemble du ministère des affaires contentieuses et du recouvrement des créances en litige.

Art. 7. – Le présent décret entrera en vigueur le 1er janvier 1991.

Art. 8. – Sont abrogés :

- le décret n° 86-129 du 28 janvier 1986 modifié portant organisation de l'administration centrale du ministère des P.T.T. ;
- le décret n° 87-301 du 30 avril 1987 relatif aux missions et aux principes d'organisation de l'inspection générale des postes et télécommunications.

Art. 9. – Le ministre d'Etat, ministre de la fonction publique et des réformes administratives, et le ministre des postes, des télécommunications et de l'espace sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera publié au *Journal officiel* de la République française.

Fait à Paris, le 18 décembre 1990.

Arrêté du 20 juillet 1990 fixant la composition et les règles de fonctionnement de la commission des marchés du Centre national d'études spatiales

NOR : *PTTE8991155A*

Le ministre d'Etat, ministre de l'économie, des finances et du budget, le ministre des postes, des télécommunications et de l'espace, le ministre de la recherche et de la technologie et le ministre délégué auprès du ministre d'Etat, ministre de l'économie, des finances et du budget, chargé du budget,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un Centre national d'études spatiales ;

Vu le décret n° 84-510 du 26 juin 1984 modifié relatif au Centre national d'études spatiales ;

Vu le décret n° 86-129 du 28 janvier 1986 portant organisation de l'administration centrale du ministère des P.T.T., modifié notamment par le décret n° 88-1121 du 14 décembre 1988 ;

Vu l'arrêté du 20 juillet 1990 fixant les modalités de fonctionnement financier du Centre national d'études spatiales, et notamment son article 9,

Arrêtent :

Art. 1er. - La commission des marchés instituée auprès du Centre national d'études spatiales par l'article 9 de l'arrêté du 20 juillet 1990 susvisé comprend :

Un membre du Conseil d'Etat ou un magistrat de la Cour des comptes, ou un membre de l'inspection générale des finances, président ;

Le délégué général à l'espace ou son représentant, vice-président ;

Un représentant du délégué général pour l'armement ;

Le secrétaire général de la Commission centrale des marchés ou son représentant ;

Le contrôleur d'Etat du Centre national d'études spatiales ;

L'agent comptable principal du Centre national d'études spatiales ou son représentant ;

Le secrétaire général du Centre national d'études spatiales ou son représentant ;

Le chef du service des affaires juridiques et contractuelles du Centre national d'études spatiales ou son représentant ;

Le chef de la division politique industrielle du Centre national d'études spatiales ou son représentant.

Pour chaque marché examiné, le directeur qui en a pris l'initiative, ou son représentant, assiste avec voix consultative aux délibérations de la commission. Il peut se faire accompagner d'un expert.

Les marchés sont présentés à la commission par un ou plusieurs rapporteurs choisis soit parmi les membres du Conseil d'Etat, les magistrats de la Cour des comptes ou les membres de l'inspection générale des finances, soit parmi les membres d'un autre corps de contrôle. Le président ainsi que le ou les rapporteurs sont désignés par arrêté conjoint du ministre de l'économie, des finances et du budget, du ministre chargé de l'espace et du ministre chargé de la recherche.

En cas d'absence simultanée des rapporteurs désignés conformément aux dispositions ci-dessus, et à titre exceptionnel, les fonctions de rapporteur peuvent être confiées, par décision du président, à un fonctionnaire du ministère chargé de l'espace ou du ministère de la défense.

Les rapporteurs n'ont pas voix délibérative.

Art. 2. - Les délibérations sont prises à la majorité des voix ; en cas de partage égal, celle du président est prépondérante.

La commission ne peut valablement délibérer que si la moitié au moins de ses membres sont présents ou représentés.

Art. 3. - Sous réserve des aménagements nécessaires au respect des engagements contractuels internationaux pris par le Centre national d'études spatiales dans le cadre de l'Agence spatiale européenne, la commission donne son avis :

1° Sur les projets de marchés qui lui sont soumis par le directeur général du Centre national d'études spatiales ;

2° Sur tous les projets de marchés d'études ou conventions d'études d'un montant égal ou supérieur à 5 000 000 F hors taxe ;

3° Sur tous les autres projets de marchés ou conventions d'un montant égal ou supérieur à 10 000 000 F hors taxe ;

4° Sur toutes les questions concernant la procédure de passation et l'exécution des marchés qui lui sont posées par le directeur général du Centre national d'études spatiales.

Art. 4. - Dans le cas où il est signalé que la passation d'un marché présente un caractère d'urgence particulière, il appartient au président de réunir la commission dans le plus bref délai à moins qu'il ne juge pouvoir donner lui même un avis favorable.

Le président peut, sur proposition du secrétariat général du Centre national d'études spatiales, effectuer une sélection des contrats présentés et dispenser certains d'entre eux de l'examen par la commission.

Pour l'examen des projets d'avenants aux marchés visés à l'article 3 (1°, 2° et 3°) la commission peut déléguer sa compétence à son président.

Dans les deux cas, le président rend compte à la commission, lors de sa prochaine réunion, des avis qu'il a formulés.

Art. 5. - L'arrêté du 3 décembre 1969 modifié fixant la composition et les règles de fonctionnement de la commission des marchés du Centre national d'études spatiales est abrogé.

Art. 6. - Le présent arrêté sera publié au *Journal officiel* de la République française.

Fait à Paris, le 20 juillet 1990.

Le ministre des postes,
des télécommunications et de l'espace,
Pour le ministre et par délégation :
Le directeur du cabinet,
G. MOINE

Le ministre d'Etat, ministre de l'économie,
des finances et du budget,
PIERRE BÉRÉGOVOY

Le ministre de la recherche et de la technologie,
HUBERT CURIEN

Le ministre délégué auprès du ministre d'Etat,
ministre de l'économie, des finances et du budget,
chargé du budget,
MICHEL CHARASSE

MINISTÈRE DES POSTES, DES TÉLÉCOMMUNICATIONS ET DE L'ESPACE

Arrêté du 20 juillet 1990 relatif aux modalités de fonctionnement du Centre national d'études spatiales

NOR : *PTTE8901154A*

Le ministre d'Etat, ministre de l'économie, des finances et du budget, le ministre des postes, des télécommunications et de l'espace, le ministre de la recherche et de la technologie et le ministre délégué auprès du ministre d'Etat, ministre de l'économie, des finances et du budget, chargé du budget,

Vu la loi n° 61-1382 du 19 décembre 1961 instituant un Centre national d'études spatiales ;

Vu le décret n° 62-1587 du 29 décembre 1962 portant règlement général sur la comptabilité publique ;

Vu le décret n° 64-486 du 28 mai 1964 relatif aux régies de recettes et aux régies d'avances des organismes publics, modifié par le décret n° 71-153 du 22 février 1971 ;

Vu le décret n° 84-510 du 28 juin 1984 modifié relatif au Centre national d'études spatiales ;

Vu l'arrêté du 1er décembre 1982 relatif aux régies de recettes et aux régies d'avances des organismes publics,

Arrêtent :

Art. 1er. - Le fonctionnement financier et comptable du Centre national d'études spatiales est assuré dans les conditions fixées par le décret du 29 décembre 1962 susvisé portant règlement général sur la comptabilité publique, selon les modalités définies ci-après.

Art. 2. - Un état de prévision de recettes et de dépenses est établi pour chaque exercice annuel commençant le 1er janvier.

L'état des prévisions fait apparaître sous deux sections distinctes les opérations relatives au fonctionnement et les opérations en capital.

Il est présenté selon la nomenclature budgétaire de l'établissement et la nomenclature comptable visée à l'article 216 du décret du 29 décembre 1962 susvisé.

La présentation de l'état de prévision des recettes et des dépenses doit permettre un rapprochement avec les crédits inscrits à la loi de finances.

Art. 3. - Les opérations en capital s'exécutant sur plusieurs années font l'objet d'une présentation prévisionnelle du coût total et de l'échelonnement année par année des engagements et des paiements.

Art. 4. - L'état des prévisions des recettes et des dépenses est préparé par le directeur général et délibéré par le conseil d'administration au plus tard un mois avant le début de l'exercice. Il est exécutoire sauf opposition des ministres chargés de l'espace, de la recherche, ou de l'économie, des finances et du budget dans les conditions décrites par l'article 5, premier alinéa, du décret du 28 juin 1984 susvisé.

Art. 5. - Si l'état n'est pas approuvé à l'ouverture de l'exercice, les opérations de recettes et de dépenses sont faites sur la base des prévisions de l'exercice précédent. Toutefois, s'il est nécessaire et après accord du contrôleur d'Etat, ces opérations peuvent être faites dans la limite des prévisions figurant à l'état non encore approuvé.

Art. 6. - Les décisions modificatives reconnues nécessaires sont délibérées et approuvées dans les mêmes formes que l'état annuel des prévisions.

Art. 7. - Le président du conseil d'administration a qualité d'ordonnateur principal. Il peut, sous sa responsabilité, déléguer une partie de ses pouvoirs au directeur général ou, après avis de celui-ci, à un ou plusieurs chefs de service placé sous l'autorité du directeur général. Le président du conseil d'administration désigne les ordonnateurs secondaires.

Art. 8. - Des avances peuvent être consenties dans les conditions fixées par l'ordonnateur, avec l'accord du contrôleur d'Etat, aux personnes chargées de missions pour le compte du centre ainsi qu'aux personnes, sociétés ou organismes mandatés par le centre pour opérer pour son compte. De la même façon, des avances peuvent être consenties avec l'accord du contrôleur d'Etat lorsque le centre agit pour le compte d'une autre personne, d'une société ou d'un organisme.

Art. 9. - Les conditions générales de passation, de financement et de contrôle des marchés sont fixées par le conseil d'administration. Elles s'inspirent de la réglementation des marchés de l'Etat.

La composition et les règles de fonctionnement de la commission des marchés instituée auprès du Centre national d'études spatiales sont fixées par arrêté du ministre chargé de l'espace, du ministre chargé de la recherche et du ministre chargé du budget.

Art. 10. - Le rôle de l'agent comptable du Centre national d'études spatiales est défini par les dispositions du décret du 29 décembre 1962 susvisé. La comptabilité analytique est tenue par les services de l'ordonnateur sous le contrôle de l'agent comptable.

Art. 11. - Des agents comptables secondaires peuvent être désignés par le directeur général sur proposition du comptable, conformément aux dispositions de l'article 195 du décret du 29 décembre 1962 susvisé.

Art. 12. - Des régies d'avances et des régies de recettes peuvent être instituées selon les dispositions du décret du 28 mai 1964 modifié susvisé.

Art. 13. - L'arrêté du 7 février 1984 fixant les modalités de fonctionnement financier du Centre national d'études spatiales et les arrêtés du 12 février 1965 et du 4 octobre 1979 fixant les modalités de création des régies d'avances et de recettes du Centre national d'études spatiales sont abrogés.

Art. 14. - Le présent arrêté sera publié au *Journal officiel* de la République française.

Fait à Paris, le 20 juillet 1990.

Le ministre des postes,
des télécommunications et de l'espace,
Pour le ministre et par délégation :
Le directeur du cabinet,
G. MOINE

Le ministre d'Etat, ministre de l'économie,
des finances et du budget,
PIERRE BÉRÉGOVOY

Le ministre de la recherche et de la technologie,
HUBERT CURIEN

Le ministre délégué auprès du ministre d'Etat,
ministre de l'économie, des finances et du budget,
chargé du budget,
MICHEL CHARASSE

Appendix II

CNES Subsidiaries

This Appendix presents the CNES subsidiaries not examined in the main body of the thesis.

Locstar

The Locstar subsidiary was created in October 1988 with the objective of setting up and exploiting a European satellite positioning and communications network for road, sea and rail transport. Locstar aimed to provide a positioning system by 1992 and a communications facility with mobile vehicles by 1993. Such systems required two satellites produced by Matra and the necesary authorisations from the various European telecommunications regulatory bodies.

CNES originally held 15% of Locstar shares, as one of the 27 private firms, banks and telecommunications organisations which set up the company in its initial format. The initial structure of the company gave a majority French interest, but in December 1989 the company attempted to increased its capital from 100 million francs to 800 million francs by opening its shares up to Daimler-Benz and Mannessman, GEC and British Aerospace and Olivetti, amongst other new participants. The new shareholders brought the total number of shareholders to 50, removed the French majority ownership, and saw the reduction in CNES' holding to 8.87% This first extension of ownership resulted in an increase of capital to 676 million francs in March 1990, which was still insufficient to underwrite the envisaged 2.5bn franc investment in the Matra satellites and their launches by Ariane.

In the face of declining enthusiasm for the project amongst Locstar's shareholders and government, this ambitious investment plan was reduced to 1.5bn francs in April 1991, and total funds never exceeding 1bn francs, the company was placed in liquidation in July 1991.[1]

Novespace

Novespace is a technology transfer subsidiary company set up in July 1986 by CNES, the *Agence nationale pour la valorisation de la recherche* (ANVAR), and a

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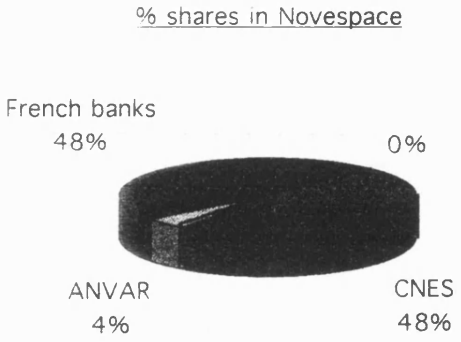
1 See Le Monde 26 June 1991, 'Locstar sur la voie de la liquidation', and 27 April 1991, La Lettre du Cnes, Nos. 119,126, 127.

variety of banks and financial institutions. Its primary aim is to promote the use of space microgravity and to facilitate the transfer of technologies developed in space research and development programmes to other sectors. To do this Novespace provides marketing, legal and financial services to companies or organisations wanting to transfer or to acquire space technologies.



(Source: CNES Annual Report 1986)

Until 1989, Novespace's financial details were not revealed, but since 1989 the published figures for turnover show a rapid increase in the use of the company's services from 6 million francs in 1989 to 9.5 million francs in 1990 and 16 million in 1991.

Scot Conseil

The *Service de consultance en Observation de la terre* was created in September 1987 by CNES and a group of banks and financial institutions. Although the subsidiary was initially wholly owned by CNES, in 1992 CNES owned 75% of the shares and the remaining 25% were divided amongst the banks and finance houses. The company provides a consulting service in the engineering, finance and application of remote sensing systems. As with the other companies in which CNES has shareholdings, the turnover of Scot Conseil has increased significantly in the late-1980s and early-1990s from 15 million francs (1989) to 24.4 million francs (1991).

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